

DEVELOPMENTS IN END-USER COMPUTING

INPUT

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DEVELOPMENTS IN END-USER COMPUTING

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Developments in End-User Computing

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Abstract

In recent years the growth in end-user computing has been phenomenal. There have been many forces that have stimulated this growth. On the technology side, continuous developments in personal computers and business software, along with the growing accessibility of data through new network connectivity technologies, have been primary facilitators of this growth. The direct application of information technology to business operations and decision making processes has also been a stimulating factor. The growing computer literacy of the office work force has also reduced both the cost and implementation time required to move new applications directly into the work place.

This study examines how this explosion in end-user computing has affected end-user support organizations. It addresses current organizational, budgetary, and service issues, and forecasts the primary issues that end-user computing will face over the next several years.

The report also addresses the types of technologies currently being deployed in the end-user environment and analyzes what new requirements the change in this mix will place on the end-user computing function in the early 1990s.

The study is based on over 100 interviews with end-user computing managers throughout the U.S. The resulting analysis is presented in 91 pages with 32 exhibits.



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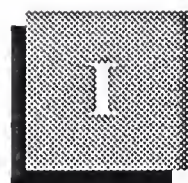
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Introduction



Introduction

The evolution of end-user computing from an insignificant phenomenon focused on highly specialized analytical applications to a major component of corporate information technology strategy has occurred in less than 15 years. Ironically, many information systems (IS) executives who once perceived end-user computing as a threat to their control of the information systems environment now actively utilize the growing capability of end users and the related technologies as a key asset in supporting the development and implementation of new applications systems.

This rapid evolution has not been without its difficulties. Providing support to end users has been fraught with organizational, standardization, technological, and political issues from the time the term "end-user computing" was coined. Balancing conflicting objectives has been the source of many of the difficulties. End users have traditionally been focused on solutions and frequently have had little interest in the standards, methodologies, and approaches which are required to develop auditable and maintainable systems. As the systems that end users have developed from personal use (frequently used only for analytical staff support) evolve into the realm of business operations (impacting organizations and business processes), the questions of integrity and maintainability have become more critical. At the same time the internal IS function, in many instances, has been slow to recognize both the inevitability and the potential of end-user computing, treating it to some degree as a necessary evil.

These situations have been changing rapidly over the past several years. In many organizations a balance is being struck. The intent of this report is not to examine the history but to take a snapshot of where end-user computing is today and the issues that it is likely to confront over the next several years.

A

Objectives

The study has four major objectives:

- To examine the organizational approaches employed today in supporting end-user computing
- To examine the kinds of products and services that are being supported for the end-user environment
- To gain an understanding of what is happening in the business and technology environments that is likely to impact end-user computing over the next several years
- To forecast the major issues that end users and the end-user support function will need to address, to move effectively into the 1990s

B

Methodology and Scope

1. Methodology

The results of this study are based on a sample of over 100 interviews conducted with managers of end-user computing support functions in major U.S. corporations. The survey was conducted jointly by INPUT and the Profit Oriented Systems Planning Program (POSPP), which is a major association of over 150 Chief Information Officers (CIOs) focused on the practical advancement of information technology in the business environment. INPUT would like to acknowledge POSPP and its membership for their cooperation and management of the survey effort.

The survey guide was approximately 20 pages in length and explored all of the following subject areas:

- | | |
|----------------------------------|--------------------------|
| • Company demographics | • Software products |
| • Budget information | • Hardware products |
| • End-user support organizations | • Connectivity products |
| • End-user service offerings | • Platform growth rates |
| • User requirements | • New technology impacts |
| • Futures - major issues | • Power users |

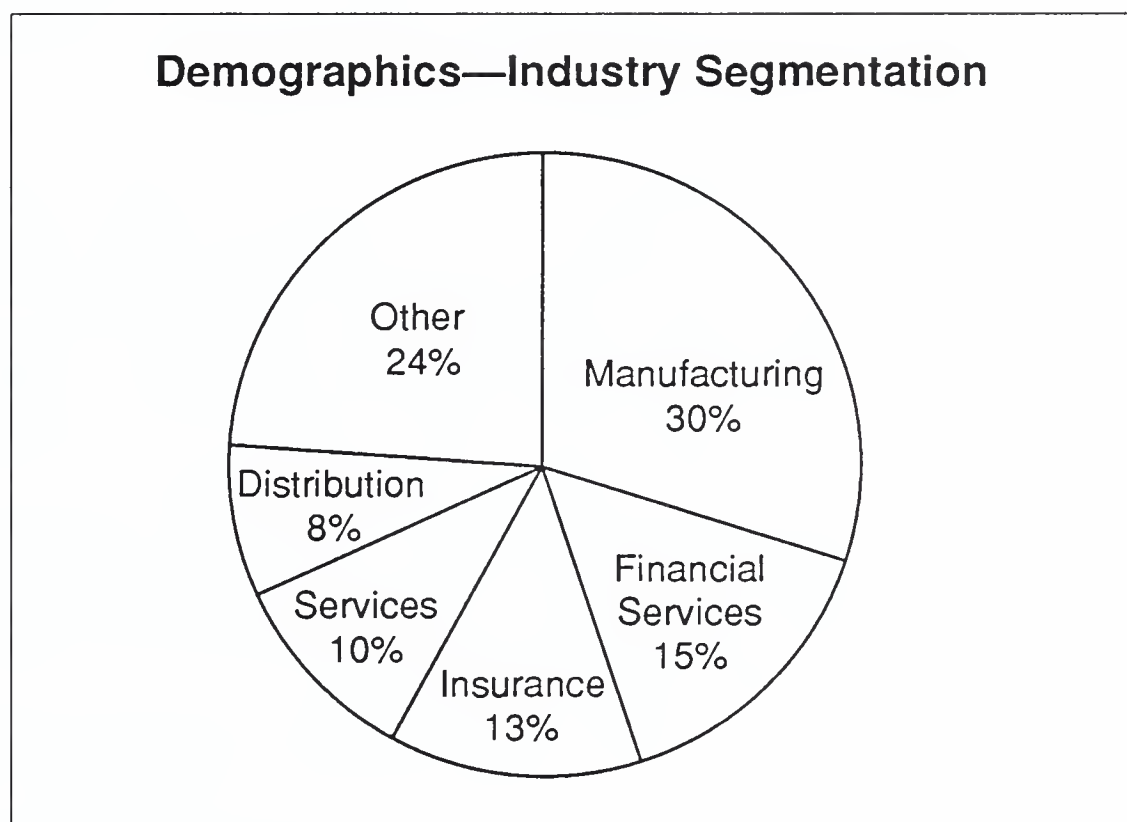
Quality control of the surveys proved time consuming. Some respondents would not or could not respond to specific portions of the questionnaire, and in some instances data integrity caused all or portions of the survey information to be eliminated from the analysis. The net result is that sample sizes used for tabulating various portions of the questionnaire vary. However, the minimum sample size used in the preparation of this report was 50.

In addition to the data obtained from the joint POSPP/INPUT survey, this report utilizes some of the information obtained from survey work done for INPUT's 1990 *Developments In Data Base Management* and

The Future of IS Management reports. Reference to the use of this information is given throughout this report as appropriate.

The population participating in the survey represents a broad range of industries. Exhibit I-1 shows the population of respondents segmented by industry. Although some cross-tabulations were run to compare responses by industry segment, INPUT was unable to identify many significant differences in responses based on industry. In those few instances where responses did appear to vary among industries, observations are noted directly in the report.

EXHIBIT I-1



2. Scope

The research and analysis contained in this report focuses on the support organizations providing software, technology, and professional services to end-user organizations. Some organizations included in the study reported directly to user departments. The majority were under the direct management of an information systems organization.

The study does not deal with major implementation efforts such as large-scale systems integration projects which in many instances are being managed by user departments. In the section of the survey dealing with future issues, many respondents saw an increasing role for the end-user computing function in implementing this type of project.

C**Report Structure**

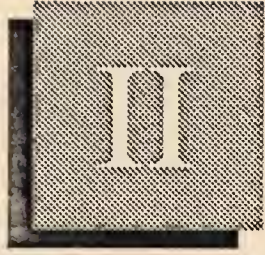
The following is a brief description of the organization of this report:

- Chapter II is an Executive Overview providing a summary of the analysis, conclusions, and recommendations of the report.
- Chapter III, *EUC Objectives and Organization*, describes how end-user computing (EUC) functions are currently organized and the underlying role that they play in today's organization. The chapter also examines the budgetary issues associated with the EUC function.
- Chapter IV, *User Requirements and Services*, profiles the kinds of services that end users are demanding and discusses the approaches and technologies the end-user computing organizations are taking in order to meet those demands.
- Chapter V, *Issues and Future Trends*, presents the respondents' views on key trends and issues that will affect the role of end-user computing in the immediate future and gives INPUT's interpretation of the impact that these trends are likely to have. This chapter also gives INPUT's recommendations on how the end-user computing function should prepare to deal with these evolving trends and discusses future application areas.
- Chapter VI, *Conclusions and Recommendations*, gives INPUT's conclusions based on the overall analysis and makes recommendations for what EUC organizations should do to deal with developing future trends.

D**Related INPUT Reports**

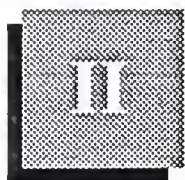
Recent INPUT reports of direct relevance to this study include:

- *The Future of Information Systems Management* (1989)
- *Developments in Data Base Management* (1989)



Executive Overview





Executive Overview

This study focuses on the status of end-user computing (EUC) today and the trends in technology and business that are likely to impact the role and organization of EUC over the next several years. The research conducted to support the analysis and conclusions was designed to support the following objectives:

- To examine the current organization and responsibilities
- To determine the products and services that are being supported by EUC
- To gain an understanding of what is happening in the business and technology environments that is likely to impact end-user computing over the next several years
- To forecast the major issues that end users and the end-user support function will need to address in order to move effectively into the 1990s

A

Background and Methodology

1. Reasons for the Study

The motivation for this research was based on an underlying hypothesis that end-user computing has undergone some significant changes in recent years and is likely to see even more dramatic changes in the near future. This hypothesis is based on the following observations:

- The introduction and widespread propagation of personal computers into the end-user environment has increased the technology available to end users and created opportunities for applications not possible using the traditional timesharing environments which were the technological mainstay of the traditional information center.

- The current integration of PCs into traditional applications environments as well as local-area networks (LANs) has multiplied both the complexity of and opportunities for end-user utilization of technology; consequently, demands for technology and applications support for EUC have been elevated.
- General trends in the deployment of information systems indicate that user departments and divisions are increasingly taking charge of their own development activities. The assumption is that this general trend has affected and will continue to affect both the organization and role of EUC.

2. Methodology and Scope

To examine the assumptions underlying the hypothesis a joint research effort was conducted by INPUT and Profit Oriented Systems Planning Program (POSPP—a major association of over 150 Chief Information Officers (CIOs) focused on the practical advancement of information technology in the business environment). Over 100 respondents from a wide range of Fortune 1000 companies participated in this survey, a copy of which is contained in Appendix A. In addition to the data obtained from the joint POSPP/INPUT survey, this report utilizes some of the information obtained from survey work done for INPUT's 1990 *Developments In Data Base Management* and *The Future of IS Management* reports.

The research and analysis contained in this report focuses on support organizations involved in the provision of software, technology, and professional services to end-user organizations. The study does not deal with major implementation efforts, although survey results clearly indicate that many respondents participate in such projects.

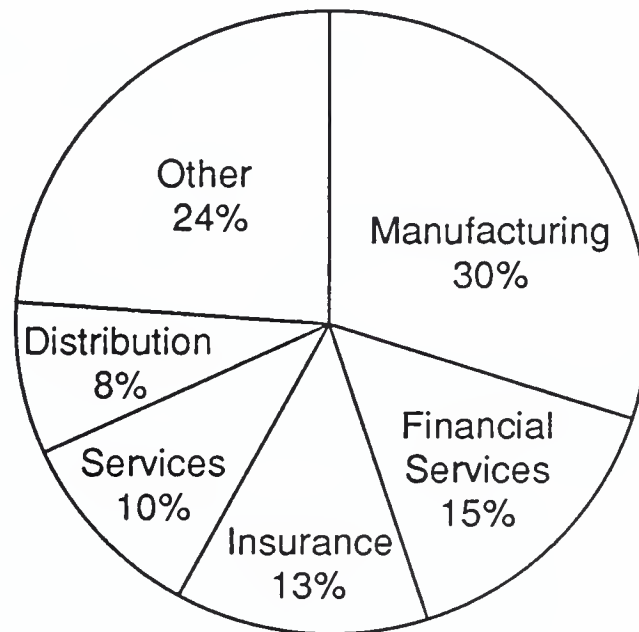
3. Demographics

Exhibit II-1 shows the survey population broken down by industry.

The companies surveyed had an average of 17,700 employees, and as might be expected, the variance was large. The data collected in the survey was limited to management, professional, and administrative populations; the number of workstations, software installations, etc. included in the tabulations did not count those dedicated to "heads-down" clerical functions. Given those ground rules, the companies in the sample had on the average 1,500 microcomputers and 2,700 traditional workstations. Based on other information gathered in the survey, it is estimated that this represents a penetration of about 25% (i.e., 25% of the management/professional work force has a workstation that presumably is used in some capacity for end-user applications).

EXHIBIT II-1

Demographics—Industry Segmentation



B

EUC Organization and Objectives

1. EUC Organization and Budgets

a. Organizational Parameters

The average age of the EUC organizations in the survey was 6 years with about 30% of them having been in existence for over 10 years. Other statistical findings regarding these organizations follow:

- In general they are small, averaging 13 full-time employees each.
- Over 30% utilize outside consulting resources to supplement their full-time in-house staff.
- For the 30% that use outside resources, the number of outside professionals averages about 20% of in-house staff.

The variety of organizational structures used to support end users is quite broad. Approximately 70% of the organizations surveyed report directly to a corporate information systems organization. The larger the firm, the greater the tendency for the EUC function to report directly to the head of information systems or CIO. The second most popular reporting route was to the head of the systems development function. Of the 30% that did not report to corporate IS, the dominant reporting relationship was to the head of an operating unit's information systems organization. Re-

ardless of reporting relationship, most units divided the basic responsibilities into three primary functional areas: customer service, end-user technology, and hotline and administration.

Exhibit II-2 summarizes the primary responsibilities of each of these areas.

EXHIBIT II-2

Primary Responsibilities of EUC

Functional Area	Responsibilities
Customer Service	<ul style="list-style-type: none"> - Evaluation and selection of hardware/software - Installation and training - Applications coaching and support
End-User Technology	<ul style="list-style-type: none"> - Evaluating/testing new hardware and software - End-user architecture - End-user standards
Hotline & Administration	<ul style="list-style-type: none"> - Problem identification/resolution - Software and hardware administration - Hotline accounting

In general, the administrative activities assigned to EUC organizations are not trivial. With an average of over 2,200 individual customers per EUC shop, administration cannot be underestimated.

b. Budgets and Chargebacks

The survey data indicates that the average budget for an EUC organization is \$720,000. In INPUT's view, however, this number is likely to be on the conservative side for two reasons:

- Approximately one-half of the respondents did not report budget data, and a review of the responses indicates that they tended to be the larger companies participating in the survey.
- Only 60% of the respondents indicated that end-user hardware and software dollars were included in their budgets. The implication is that in these companies, hardware is carried directly in either the corporate IS function or in end-user budgets.

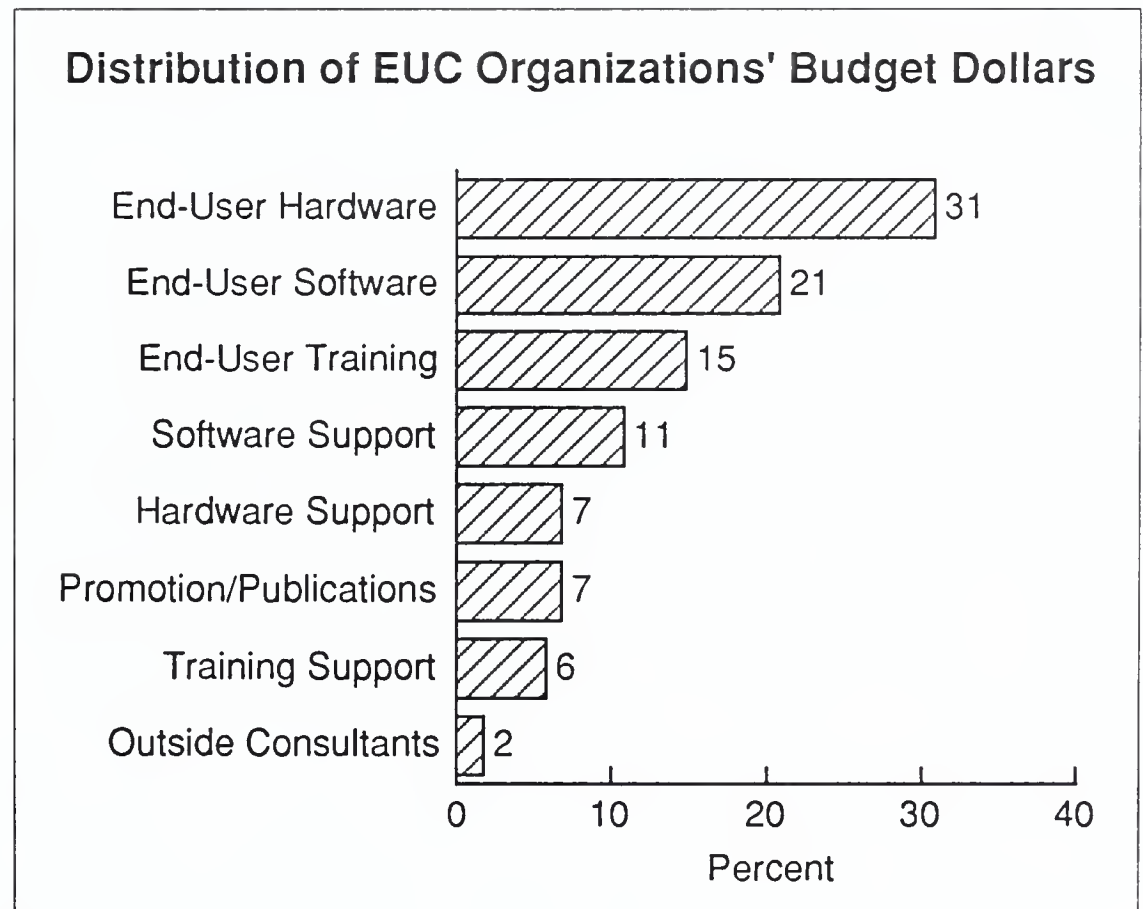
Based on additional budget information contained in the survey, INPUT estimates that if the budgetary information was normalized to reflect inclusion of user hardware and software within the EUC budget, the average budget for survey respondents would have been in the area of \$1,000,000. In addition, adjusting the budget figures proportionately for those larger firms that did not respond would probably push the average into the range of \$2,000,000 per year.

There is a higher degree of consistency in the responses to the question of how budget dollars were used.

Exhibit II-3 represents the allocation of that portion of the typical EUC organization budget that is dedicated directly to providing end-user-related services and does not include any portion of the budget that would be directed toward:

- Evaluation and selection of hardware or software
- Creation and management of standards
- Internal systems development or product integration

EXHIBIT II-3



Subtracting those portions of the budget that directly relate to hardware and software, it is apparent that most activities undertaken in the name of support are related to training end users and assisting them with the use of installed hardware and software.

Approximately one-third of the organizations surveyed charge back for the support services they provide. Furthermore, of those that do charge back, most do so on an annual cost allocation basis where the allocating parameter is the average annual use of EUC professional services.

2. EUC Objectives

A composite ranking of objectives for the survey respondents is included in Exhibit II-4.

EXHIBIT II-4

EUC Objectives Ranked by Weighted Frequency	
1	Facilitate and improve productivity
2	Establish and promote standards
3	Provide training, support, and service
4	Consult on data and applications

Clearly the first three objectives are what one would expect. The fourth, which was cited by 25% of the population as a major objective, is key to the direction that EUC is likely to take in the future. In one sense, there is nothing new about this objective. One of the original goals of the information center was to provide support to end users regarding the availability of data and to develop simple applications that extracted information for manipulation and reporting purposes.

However, meeting this objective in the context of the kinds of hardware and software that are in the hands of end users today requires the information center to play a significantly larger role in the development of end-user applications than was intended within the initial concept of the typical information center.

C

User Requirements and Services

The survey examined both EUC's assessment of what capabilities users require in today's environments as well as the types of services being delivered to support the capabilities. On the requirements side there was a high degree of consistency in terms of users' expectations. Exhibit II-5 shows the frequency for groups of capabilities examined in the survey.

EXHIBIT II-5

Frequency of End-User Computing Requirements

Percentage	Requirement
80 - 100%	Electronic mail Word processing Spreadsheets Presentation graphics Local data bases (internal)
50 - 80%	Desktop publishing Data bases (external) General office automation 4GL applications
15 - 50%	Expert systems CAD/CAM CASE

A quick scan of the list shows how significantly the introduction of the personal computer has broadened the scope of capabilities that users have come to expect.

Typically, respondents indicated that their primary role in supporting this array of capabilities was focused on hardware/software evaluation, installation, training and problem resolution related to the hardware and software technology supporting these capabilities. In addition, approximately 60% of the EUC organizations in the survey did indicate that they provide application design support services for some subset of the capabilities.

If we examine the services provided by the 20 largest EUC organizations we find that:

- 96% provide design and custom programming services
- 90% support internal end-user data base technologies
- 80% are involved in specialized applications such as CASE, executive support systems, and integrated office technology

Generally, this is the direction that INPUT sees EUC taking in the long run.

D**Platforms and Connectivity**

The EUC organizations participating in the survey support a large variety as well as a large number of end-user platforms. In total, respondents reported supporting:

- over 50,000 personal computers
- over 1,100 minis
- more than 125 mainframes
- in excess of 71,000 mainframe or mini-connected terminals

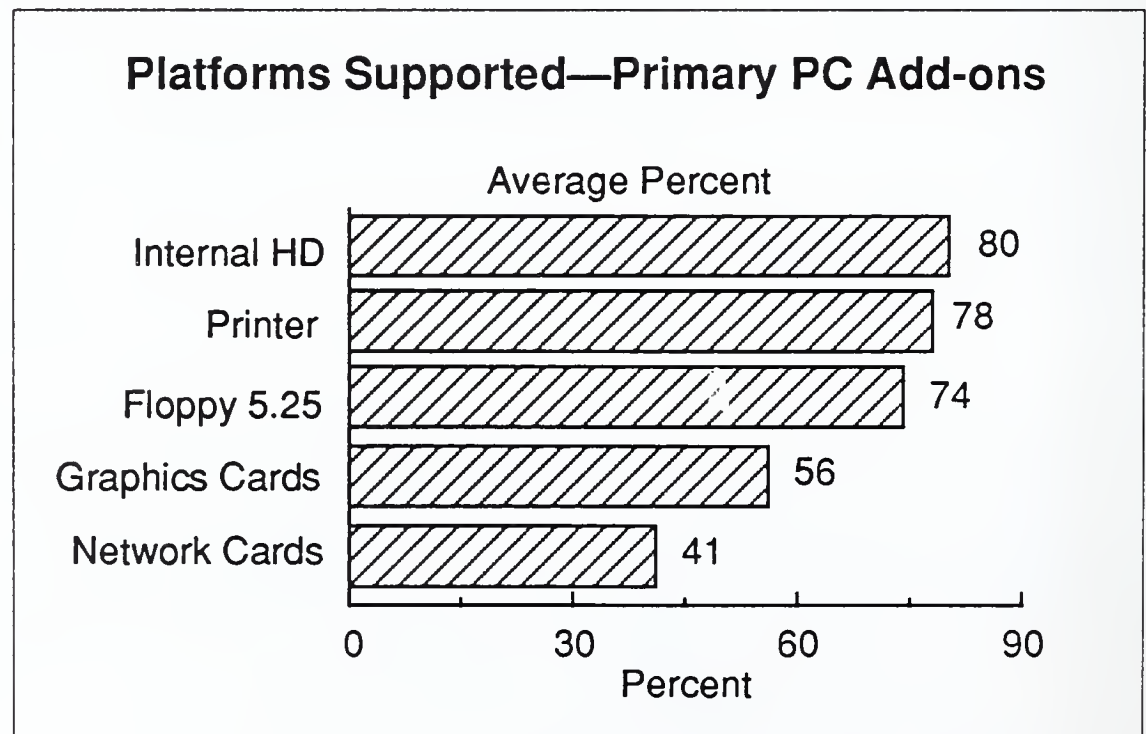
While the majority of the focus has been on the PC, it is important to note that the mainframe and minicomputer environments play an important role as platforms for electronic mail and shared office systems, general purpose timesharing and data extraction applications.

1. Current PC Hardware Environment

While Apple technology is generally accepted as a second standard in most corporations, it's quite clear from the survey results that Intel-based technologies dominate the corporate end-user environment. Of the 50,000 personal computers captured in the survey 45,000 were Intel-based, and approximately 50% of those were in the 286 class. Seventy percent of the Intel-based personal computers had an IBM logo.

The frequency of hardware add-ons identified in the survey is shown in Exhibit II-6, and certainly denies any notion that end users are going to be happy with diskless workstations or shared printing environments. In fact, INPUT believes that the constantly declining prices for hard disk storage, and the advent of affordable personal laser-jet printers are driving the trend in the opposite direction.

EXHIBIT II-6



2. Current PC Operating System Environment

On the operating systems side, the picture is not nearly so progressive as some manufacturers would like it to be. Over 95% of the installed Intel-based systems are running under DOS, with about three-quarters of those utilizing IBM's version, and the remaining quarter Microsoft's. The small sliver of the pie that's left is split primarily between UNIX and OS/2.

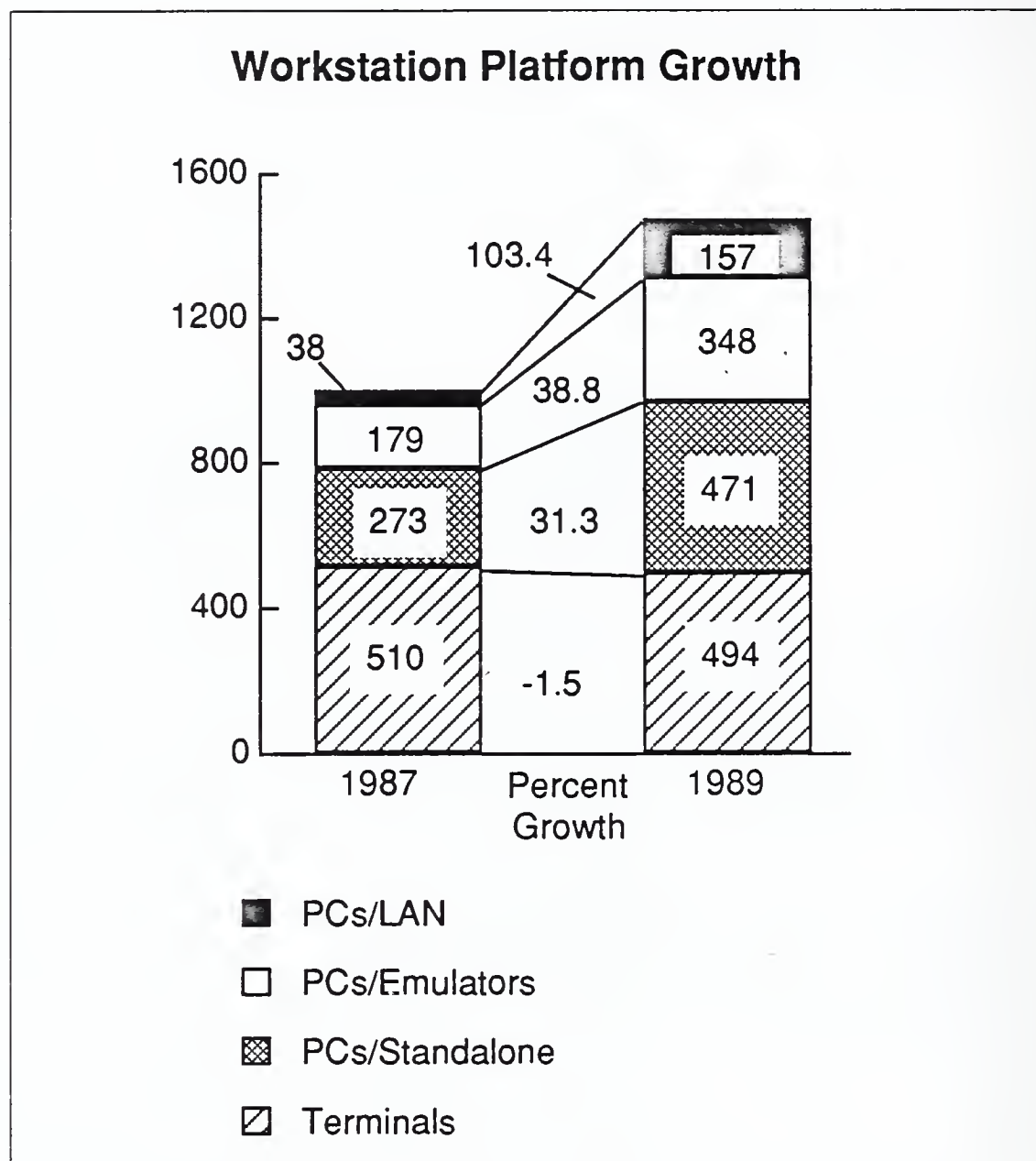
It's quite clear that the end-user environment has not made the shift to the next level of operating system. INPUT believes that end users see little benefit for the cost and pain that will be required to get there. Until the major writers of PC software produce products that leverage the features of these newer operating systems, INPUT does not expect to see a major migration. There's little doubt it will happen, but the question is when.

3. Workstation/PC Connectivity

As Exhibit II-6 shows, the modem is gradually being displaced by one of two types of hard-wired connectivity. Some 41% of the PCs in end-user environments now have network cards, with about one-third of these being LAN adapters and the remainder terminal emulation cards. Even though some 11% of all end-user PCs still sport a modem, the direction is clearly toward direct network connection. As Exhibit II-7 points out, the LAN route has been growing at an amazing 103% compound annual growth rate (CAGR) over the past two years.

INPUT anticipates that improvements in file server software will sustain this growth at least for the next several years. The only inhibiting factor will be the ability of the traditional PC business software suppliers to provide LAN-based versions of their popular packages that in fact take advantage of the server environment.

EXHIBIT II-7



4. PC-Based End-User Software

The survey yielded no surprises in the area of PC software. The leading packages in each category were:

- Spreadsheet - Lotus 1-2-3
- Word processor - WordPerfect
- Data base - dBase
- Modem-based communications - Crosstalk

It should be noted, however, that a number of packages have been climbing the list in terms of popularity, including Excel in the spreadsheet category and Paradox in the data base class. INPUT's analysis of developments in the PC software area is covered in more detail in Chapter IV.

E

Issues and Trends

INPUT believes that the primary issues and trends which will confront end-user computing will be centered around:

- *Platform Migration*—Sooner or later the driving forces from outside of end-user computing will dictate that it's time to move on to the next level of operating system. The process is not going to be easy. Users have made significant investments in training and development based on the DOS environment. To date, the benefits of moving on have not been apparent, and the costs in training, hardware and software are high. Nevertheless, as end-user workstations become more integrated into the general corporate computing network, the decision to move on cannot be made on an individual basis.
- *Platform Integration*—As the PC-based workstation is increasingly seen as a window into the network as well as a legitimate platform for the development of traditional applications systems, two levels of integration must occur:
 - Integration of the software offerings on the workstation itself; personal productivity, office systems, and applications software
 - Integration of the end-user platform into the overall architectural fabric of the general computing environment

This integration will significantly raise the complexity of the training and support function which will need to be provided to end users.

- *New Technologies*—Relational and distributed relational data base systems will create new opportunities and significant issues for end users that will raise the requirements for end-user support. Couple these technologies with the complicating factors potentially generated by LAN connectivity and local repositories, and suddenly the end user is intimately involved in dealing with the same data management, security and integrity issues that were once reserved for the traditional applications environment. Developments in these areas will provide new challenges for both end users and EUC.
- *Standards*—With integration operating as a primary driving force, the need to move toward standardized workstations and common release levels of the standard software will become more imperative. As pointed out earlier, end users are likely to resist this trend unless they see immediate benefits. Even if they do, the logistics of distributing the software and implementing the necessary training are going to be complex.
- *Decentralization*—As end users take more control over their applications environment, the trend has been to decentralize traditional systems development activities. This decentralization, coupled with the

need for an overall architectural strategy, will force EUC and traditional IS to forge common strategies in critical technology areas. This has not always been the case. It will involve give and take from both viewpoints, and is likely to broaden the role of EUC within the context of traditional applications development.

F

Conclusions and Recommendations

INPUT's primary conclusions of this study are summarized in Exhibit II-8.

EXHIBIT II-8

General Conclusions

Area of Impact	Primary Conclusions
Integration	Will demand increased sophistication of support Requires greater technological proficiency Involves EUC in production applications Will require better EUC management processes
End-User Architecture	Will be more workstation focused Requires integration with overall architecture Must have a network orientation
EUC Organization	Will be impacted by changes in corporate IS Must respond to decentralization of development May merge with traditional development

Based on these conclusions, INPUT has developed a number of recommendations which it believes will assist EUC in positioning itself to maximize its opportunities in the future. These recommendations are summarized in Exhibit II-9.

There is no question that EUC will face a new series of challenges and opportunities for the 1990s.

The remainder of this report explores the survey results in greater depth, and expands on INPUT's analysis.

EXHIBIT II-9

Recommendations for EUC*Organizational Development*

1. Infuse EUC personnel with the knowledge of their clients' business.
2. Plan now to make overall investments in upgrading technical proficiency.
3. Encourage the development of project management skills.
4. Utilize "power users" as part of the EUC delivery process.
5. Focus on key support and technology areas.

Technology

1. Develop standardized integrated product offerings for end users.
2. Focus product evaluation on extensions to existing or revolutionary technology opportunities.
3. Develop migration plans jointly with and in support of an overall corporate architecture.

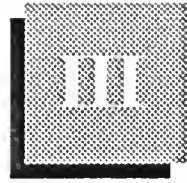
User Relationships

1. Move from a reactive to a proactive posture through joint planning with end users.
2. Utilize account management concepts to strengthen user relationships.



EUC Objectives and Organization





EUC Objectives and Organization

A

Demographics

As pointed out in the introduction, the companies participating in this study represent a wide variety of industries. Similarly, the participating companies varied considerably in overall size. The average number of employees per company was 17,700.

The survey also addressed the number of personal computers/workstations and traditional terminals within the end-user environment. Respondents were asked to estimate these numbers for professional personnel within their companies. In other words, workstations of any kind applied to “heads-down” clerical processing or other strictly repetitive operations were **not** to be counted. Given that definition, the companies in the sample had, on the average, 1,500 microcomputers and 2,700 traditional workstations in the environment, for a total of 4,200 per company. In other words, approximately 25% of the professional work force in the sample companies had some sort of dedicated workstation capability.

With these fundamental demographics in mind, let’s examine the objectives, structure, and budgetary characteristics of the end-user computing (EUC) organizations as captured in the survey.

B

Objectives and Organization

Though many of the firms surveyed have had formalized EUC organizations in place for more than ten years (over 30%), others have only recently been formed. The average age of the organizations surveyed was 6 years. In general, the organizations were small, averaging 13 full-time professionals. However, over 31% make use of part-time or contract employees on a regular basis. For those organizations that use contract professionals, the typical number is 20% of the full-time professional staff.

1. Objectives

Most of the organizations surveyed were relatively clear on their objectives. Respondents were given a list of potential objectives and asked to rank them in order of importance. They were also allowed to introduce objectives that were not included in the standard set. Exhibit III-1 lists the top four objectives ranked by their weighted frequency of occurrence.

EXHIBIT III-1

EUC Objectives Ranked by Weighted Frequency

- 1 Facilitate and improve productivity
- 2 Establish and promote standards
- 3 Provide training, support and service
- 4 Consult on data and applications

Some observations on each objective follow:

- **Facilitate and Improve Productivity**—This was clearly the leader in the weighted ranking. Over 80% of the respondents included this objective in their top four. Though it was not possible from the survey data to deduce the organizational scope of this objective, it was reasonably clear from other responses supplied in the survey that the organizational span of the charter was primarily office, administrative and management staff.
- **Establish and Promote Standards**—This objective was either high on a respondent's ranking or didn't make the top four. INPUT believes that this bimodal response resulted from the fact that standards activities tend to be highly centralized operations. As a result, in some companies the EUC function has been assigned direct responsibility for standards impacting the end-user arena, resulting in a very high ranking for the objective. In others, end-user standards are probably the responsibility of a centralized standards function and EUC's role may simply be to participate in standards formulation or promote or monitor compliance, resulting in a lower ranking by EUC organizations.
- **Provide Training, Support and Service**—Although this appeared in 90% of the individual respondents' top four objectives, its weighting (position in rank) was typically lower than other objectives. This is somewhat surprising, considering the fact that all but a small handful of the companies interviewed had hands-on support and service responsibility. INPUT believes that there might be two reasons for this:

- As in the case of the survey which perceived its importance.
- The operation in the minds of respondents might have felt that it would improve productivity.
- Consult on Data: 25% of the respondents when they did not think that the role of the emerging technology of this point is

alized training activities, thus reducing the number of users, thus reducing

lowered its position in the minds of respondents might have felt that it would improve productivity.

g to note that only 25% of the respondents when they did not think that the role of the emerging technology of this point is

2. Organization

The variety of organizational structures is quite diverse. In some cases, the organization is directly to a company, and in other cases, the head of information technology is the head of the reporting location. The 30% that did not think that the relationship was to the organization. Regarding the basic responsibilities of the organization, the following are the most common:

- Customer Service: The organization is responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications.
- End-User Technology: The organization is responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications.
- Hotline and Helpdesk: The organization is responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications.

support end users is the most common. The surveyed report that the larger the organization, the more likely it is to have a dedicated support function. Of the organizations that have a dedicated support function, 30% of the respondents reported that the relationship was to the organization. Regarding the basic responsibilities of the organization, the following are the most common:

evaluation of the organization's performance. The organization is responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications.

new end-user functions either as a function responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications.

combined into a single function. The organization is responsible for the selection of applications and the selection of applications. It is often viewed as a function that is responsible for the selection of applications and the selection of applications.

INPUT found that managing the administrative aspects of an effective EUC function should not be underestimated. In many instances, the EUC organization has responsibility for tracking everything from hardware and software inventories (and updates), to managing network and timesharing IDs and analyzing security violations. With an average of 2,200 individual customers being supported by the typical EUC (based on INPUT's survey data) the administrative issues can be staggering.

In addition to these basic functions, many EUC organizations are directly involved in other activities which have traditionally been considered outside the scope of EUC. In fact, 62% of the organizations included in the survey reported direct involvement with customers in activities such as data administration and management, applications programming, and end-user project management. Even those that weren't directly involved in these kinds of activities at present foresee a growing involvement in these areas in the future. INPUT believes that the trend to expand the role of EUC into new areas is well underway. The driving forces and likely impacts are discussed in more detail in Chapter V.

Exhibit III-2 summarizes the key parameters that define end-user computing based on the survey sample.

EXHIBIT III-2

End-User Computing Key Parameters	
Organizational Parameter	Value
Average age of the organization	6 Years
Average number of employees	13
Utilization of contractors	13%
Average number of customers per group	2,200
Percent reporting to corporate IS	70%

3. Areas of Service

The organizations represented in the survey, although typically small, tend to have responsibility for providing services to a substantial portion of their companies. Seventy-eight percent had charters which were corporatewide; 48% were the only EUC function in their corporation.

Another way to look at the span of coverage for these organizations is to look at the support levels they provide for various types of workstations within the organization. The results of this analysis, shown in Exhibit III-3, indicate that the typical EUC organization is directly involved in providing support for about 34% of the total number of personal computers in its company, and 27% of the traditional workstations.

EXHIBIT III-3

Percent of Service Penetration*

Device	Supported	Percent
Personal Computers	516 (AVG)	34%
Dumb Terminals	724 (AVG)	27%

* Number supported divided by average per company.

Though the type of support may vary significantly, clearly the coverage is quite broad, considering the average size of most of the organizations in the survey.

C

EUC Budgets/ Financing

The survey data indicates that the average budget for the EUC organization is \$720,000. In INPUT's view however, this number is likely to be on the conservative side for two reasons:

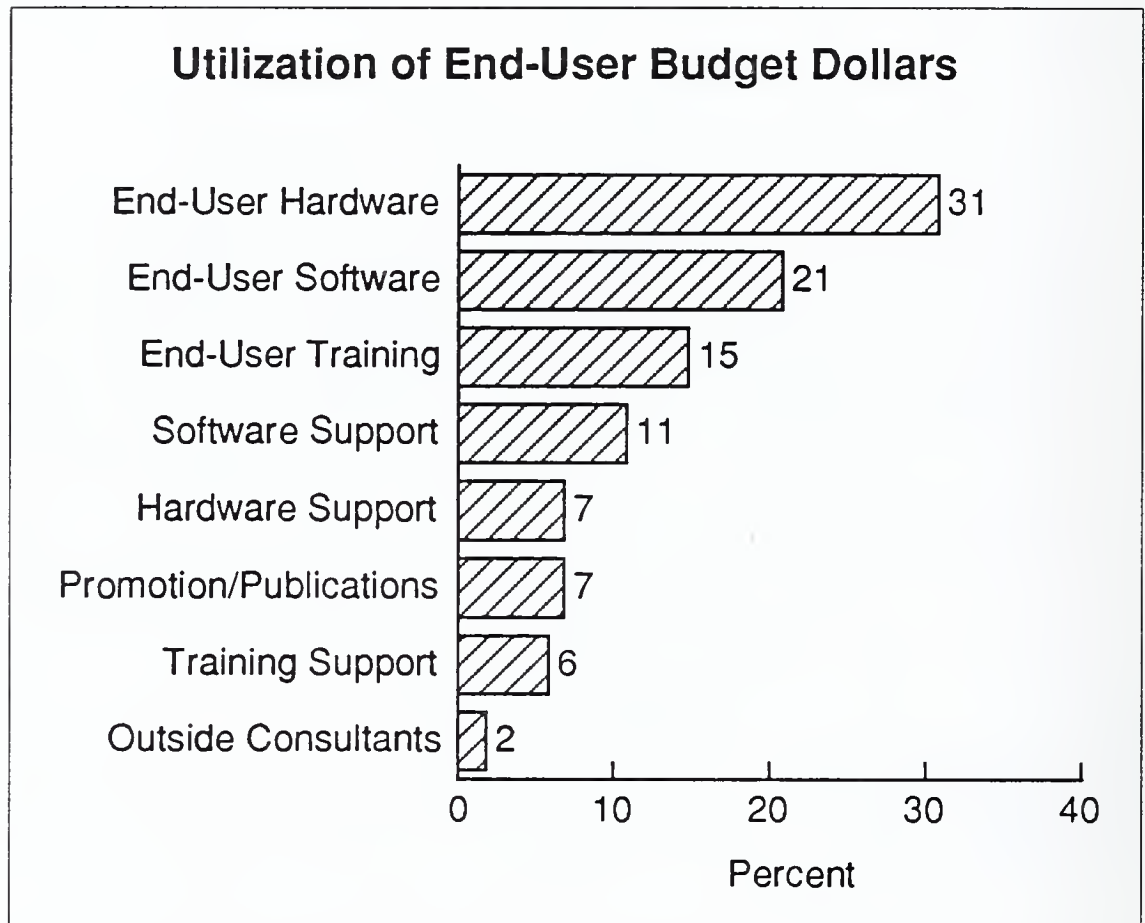
- Approximately one-half of the respondents did not report budget data; and a review of the responses indicated that those tended to be from the larger companies participating in the survey.
- Only 60% of the respondents indicated that end-user hardware and software dollars were included in their budgets. The implication is that in these companies, hardware is carried directly in either the corporate IS function, or in end-user budgets.

Based on additional information contained in the survey relating to the budgets, INPUT estimates that if the budgetary information was normalized to reflect inclusion of user hardware and software within the EUC budget, the average budget for survey respondents would have been in the area of \$1,000,000. Also, adjusting the budget figures proportionately for those larger firms that did not respond would probably push the average into the range of \$2,000,000 per year.

1. Budget Utilization

There is a higher degree of consistency on the question of how budget dollars were utilized. Respondents were asked to indicate how the budget dollars spent on end-user support were divided between a large number of categories. The results are summarized in Exhibit III-4.

EXHIBIT III-4



It should be kept in mind that this represents the allocation of that portion of the typical EUC budget which is dedicated directly to providing end-user-related services; and does not include any portion of the budget which would be directed toward:

- Evaluation and selection of hardware or software
- Creation and management of standards
- Internal systems development or product integration

If we subtract those portions of the budget which directly relate to hardware and software, it becomes very apparent that the majority of activity undertaken in the name of support is related to the training of end users and assisting them with the utilization of the installed hardware and software.

2. Financing/Chargeback

It is interesting to note that only about one-third of the organizations actually charge back for the support services they provide. This compares with a 95% figure for the typical information systems function. INPUT believes that the trend is increasingly toward charging back for these types of services. Since EUC support services are so frequently provided on demand, and typically involve short time commitments on the part of analysts and support personnel, those organizations that do charge back tend to do so on an annual cost allocation basis. That is, some portion of the total EUC support budget is allocated to a specific department it supports on the basis of historical utilization of EUC professional services.

EUC organizations that provide hardware and software to end users sometimes recover the basic support costs through a "mark-up" on the hardware and software costs. Based on INPUT's 1988 study, *Chargeback Systems*, this approach has some inherent problems, since users frequently perceive that they can get the same thing outside for less money.

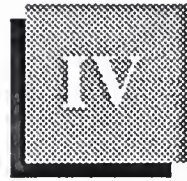
In situations where EUC is responsible for running utility networks that provide time-sharing, E-mail or other on-line services, the charging philosophy follows that of the central IS function. The same is true for EUC organizations that provide end-user programming or project management services.

Finally, about one-third of the organizations surveyed actually cover their costs through some sort of chargeback mechanism.



User Requirements and Services





User Requirements and Services

End-user computing has evolved considerably in terms of the products, services and support functions it provides to its client base. Respondents to the survey collectively identified over 50 different services. There was also significant variation in how each service was supported.

Respondents were asked to examine user requirements and services from two different perspectives. First, each participating EUC organization was asked to identify the types of functional capability that its customers demanded. Later in the survey, respondents were asked to describe what services they provided to support each functional capability, and on what types of hardware and software platforms they provided the services.

This chapter analyzes the results of the requirements and services portion of the study. Section A focuses on user requirements, Section B on types of services provided and Section C on the types of platforms for which service and support was available.

A

Current User Requirements

Section V of the survey identified 11 specific types of end-user computing requirements and gave respondents the opportunity to add to that list. For each requirement, respondents were asked to indicate whether the requirement was current, whether it was being planned for the next year, and what type of support, if any, was being provided by EUC to meet that particular requirement. The categories were labeled in a generic fashion. That is, instead of listing Lotus 1-2-3 as a client requirement, the generic category of "spreadsheets" was used. In many cases, respondents added requirements to the provided list, which in reality were special cases of the generic categories. In those cases, the data was recoded into the proper generic category for tabulation purposes.

Exhibit IV-1 gives an overview of the end-user requirements identified in the survey. The exhibit lists requirements by frequency of incidence. For each requirement, the total number of respondents who indicated that

they currently needed or had that capability was tabulated. The categories of requirements were ranked in descending order of incidence, and then grouped into percentage ranges for ease of presentation.

It's not surprising to see that end users in 80-100% of the organizations surveyed require functional capabilities such as spreadsheets, E-mail, word processing and presentation graphics coupled with some sort of local data base capability. However, the types of capabilities that are stated as end-user requirements further down in the table are worthy of some comment.

EXHIBIT IV-1

Frequency of End-User Computing Requirements

Percentage	Requirement
80 - 100%	Electronic mail Word processing Spreadsheets Presentation graphics Local data bases (internal)
50 - 80%	Desktop publishing Data bases (external) General office automation 4GL applications
15 - 50%	Expert systems CAD/CAM CASE

- The kinds of requirements appearing in the lower portion of the table tend to be more technically complex and are indicative of the needs of a growing population of more sophisticated end users.
- The capabilities are more directly related to building workgroup or functional applications than we generally think of in terms of typical spreadsheet and word processing capabilities.

INPUT believes that there will be a rising demand for these more complex functional capabilities over the next several years. This concept is supported by that portion of the survey which probed respondents' views on what types of functional capabilities they would be planning to install in the future. For example, 80% of those companies who didn't see a need for end-user 4GL capability today, are planning for the installation

of that kind of capability in the coming year. Likewise, the provision of capabilities which will permit access and integration of data bases beyond those under the direct control of local workgroups appears to be a capability which will move into the 80-100% category as a requirement over the next several years.

As for the 15-50% of the companies who indicated the need for direct end-user capabilities to support things like expert systems, CAD/CAM and CASE, INPUT believes that it's too early to draw any firm conclusions.

- Clearly, platforms and software to support end-user implementations of CAD/CAM and expert systems are increasingly available. It is quite possible that these kinds of products and development activities will increasingly be supported out of end-user computing groups. However, given the specialized nature of these types of applications, it's more likely that the consideration of these capabilities as end-user technologies will be limited to certain industry groups such as manufacturing and finance and banking in the near term.
- On the other hand, CASE technologies—originally conceived as tools for the professional programmer—could well become a common instrument in the hands of end users over the next several years. This could be particularly true in situations where end-user departments adopt more user friendly applications and data base environments, such as Oracle, as platforms for the development and management of departmental applications.

In general, the survey results about end-user requirements lead to several conclusions which will have a significant impact on how end-user support will need to be structured during the early part of the next decade.

- The growing complexity and variety of capabilities being demanded by end users implies an increasing sophistication on their part in the hands on application of information technology.
- The need to provide general productivity tools along the lines of word processors, spreadsheets and local data base management capabilities is practically universal, and is probably considered a base level from which most user departments will see their needs grow rapidly.
- Increasing demands for more sophisticated data base and connectivity technologies are likely to accelerate the growing involvement of end users in the creation and management of more traditional applications.

B**Current Services
Provided**

Looking at the survey from the viewpoint of the EUC support function also provides some interesting insights. Here the focus was on the types of end-user support and services being provided to support the various functional capabilities discussed above. Respondents were asked to comment on approximately 30 different services, and were requested to indicate whether the service was provided by EUC, another internal group, or by outside sources.

As in the case of the user requirements data, an incidence matrix was prepared, the various services were ranked from highest incidence to lowest, and then broken into categories for ease of display. A summary of the results is given in Exhibit IV-2.

EXHIBIT IV-2

Frequency Analysis of EUC Service Offerings

Percentage Offered	Type of Service
80 - 90%	Hardware/software evaluation Hardware/software diagnosis Hardware/software consultation Hardware/software standards
60 - 80%	Hotline & training services Hardware/software installation Hardware/software purchasing Loaner programs Design services
40 -60%	User newsletters & councils Data extracts External data access Relocation services Maintenance services

In general, the services currently being provided by EUC functions concentrate on facilitating the introduction and use of technology in end-user departments. There is a heavy emphasis on getting people "up and running," providing hardware and software installation support, and delivering basic training on use. On average, the statistics don't support the notion that users are receiving the kinds of advanced services that were indicated in the requirements matrix. However, INPUT believes that this is a situation where the averages are deceiving. Examining the

20 largest EUC organizations participating in the survey yields a significantly different picture. Within this population:

- 96% are providing design services and custom programming to support users in the development of their applications
- 90% are heavily involved in supporting end-user data base technologies in-house, as well as providing support for connectivity to outside data sources
- 85% have developed or support specialized technology applications such as executive support systems, integrated office environments or CASE offerings

Although most of these organizations also provide the more traditional support services, the emphasis is clearly on assisting users with the application of more advanced technologies to departmental applications systems. INPUT believes that the majority of EUC organizations will evolve in the direction of these more advanced shops over the next several years.

C

Platforms and Technology Support

The study participants support an amazing variety in addition to a very large number of systems. Exhibit IV-3 gives the totals by hardware class.

EXHIBIT IV-3

Total Platforms Supported

Platform Type	Number Supported
Personal Computers	< 50,000
Total Minicomputers	< 1,100
Total Mainframes	< 125
Mainframe/Mini terminals	< 71,000

Although many EUC organizations started by supporting dumb workstations connected to mainframe or minicomputer environments, the emphasis today is on personal computers. EUC organizations supporting mainframe, mini and "dumb" workstations today are primarily involved in three application areas:

- **Electronic Mail/Office**—As indicated in Exhibit IV-1, between 80% and 100% of the organizations surveyed utilize some sort of electronic mail. Since the majority of these systems operate primarily on main-frame or mini-based networks, EUC organizations have become extensively involved in supporting centralized mail packages such as IBM's PROFS, and DEC's or WANG's electronic mail offerings. In cases where these systems support other office functions (such as calendaring, telephone directories, etc.), EUC is usually the organization called upon for training and support, although in many instances the actual maintenance of the centralized software is handled by other organizations within the information systems function.
- **General Purpose Timesharing**—As in the case of electronic mail and office systems, the applications environment for in-house timesharing is generally managed by EUC. Evaluation of packages to serve multiple client organizations, testing, and user communications on new offerings on these centralized systems is usually the responsibility of EUC.

In recent years, timesharing environments have also been the end-user gateway to centralized data bases. Utilizing user friendly packages that run under operating systems environments such as IBM's VM, users are being supported by EUC in building and managing management information systems. Most frequently, the data bases used for these purposes are created by EUC by the periodic extraction of data from on-line operational systems.

- **Workstation Emulation**—As a migration strategy between dumb workstations and the connection of personal computers as integrated components of larger networks, many EUC organizations have been charged with the responsibility of supporting workstation emulation on personal computers. Although these emulation packages could primarily be considered operating-systems-level software, providing the ability for a PC to emulate a 3270 or VT-type terminal, they have created opportunities for applications which capture data from one environment for utilization in the other. Support of the applications created in this way, as well as hardware and software connectivity, become primarily the responsibility of EUC.

Though the primary platform focus of EUC today is the PC, the need for access to non-local data and applications that provide communications connectivity between end users has kept the pressure on EUC organizations to maintain currency and support for a growing array of mainframe and minicomputer applications traditionally utilizing the "dumb" workstation.

1. Makeup of the Current PC Environment

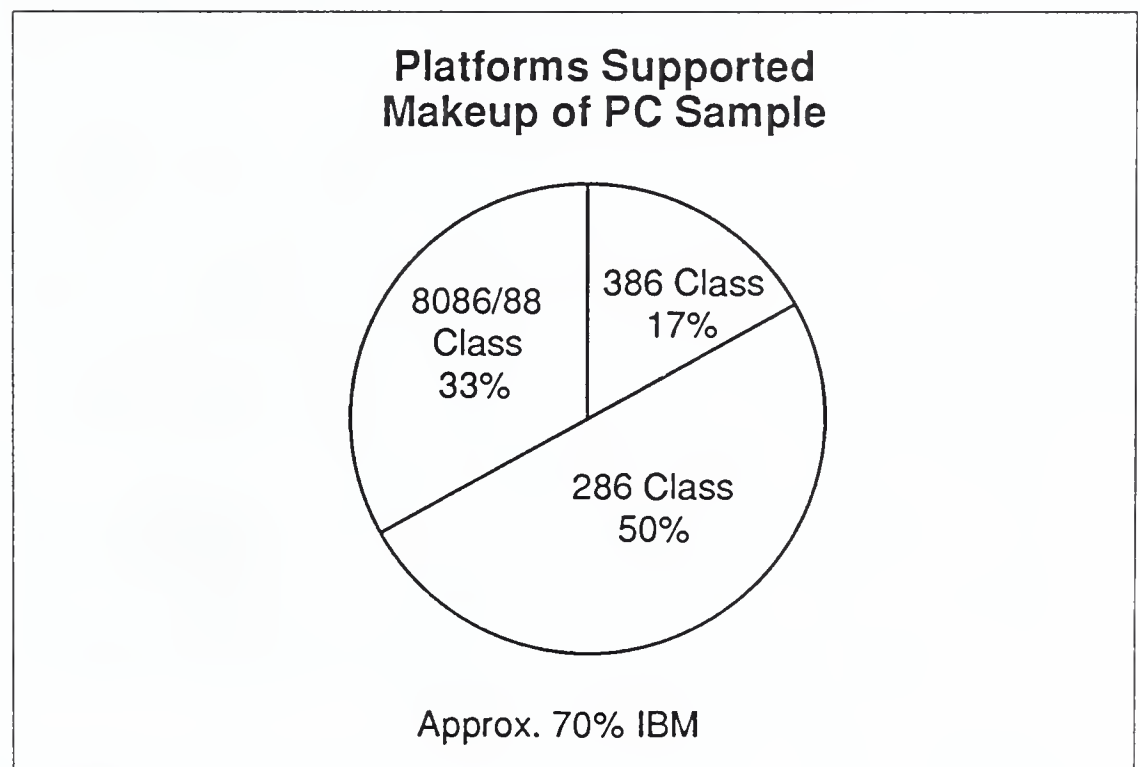
The survey provided a significant amount of information on the types of PC environments currently being supported. Of the approximately 50,000 personal computers accounted for in the survey, all but about 5,000 were IBM or IBM-compatible systems. Of the 5,000 non-IBM-compatible systems, approximately 4,000 were Apples.

INPUT does not believe that Apple's corporate penetration is as low as this sample would indicate. There are probably two reasons why the percentage for this sample is so low:

- The ease of use of Apple technology to some degree minimizes the requirement for training and support that has been the underlying motivation for the creation of end-user computing organizations. Since the population of PCs captured in the sample represents those users in the corporation that are supported by EUC organizations, it's not surprising that the percentage is low.
- In most corporate organizations, Apple technology is accepted as a secondary standard, but until recently has not been considered a primary workstation for networked or group applications. Despite the awkwardness of early implementations, the PC has had more connectivity options available for a number of years. Since EUC organizations are increasingly involved in the design and support of these types of applications, it is not surprising that they would be biased in that direction.

Exhibit IV-4 shows how the architecture of the PCs in the sample is distributed on the basis of the underlying chip architecture.

EXHIBIT IV-4



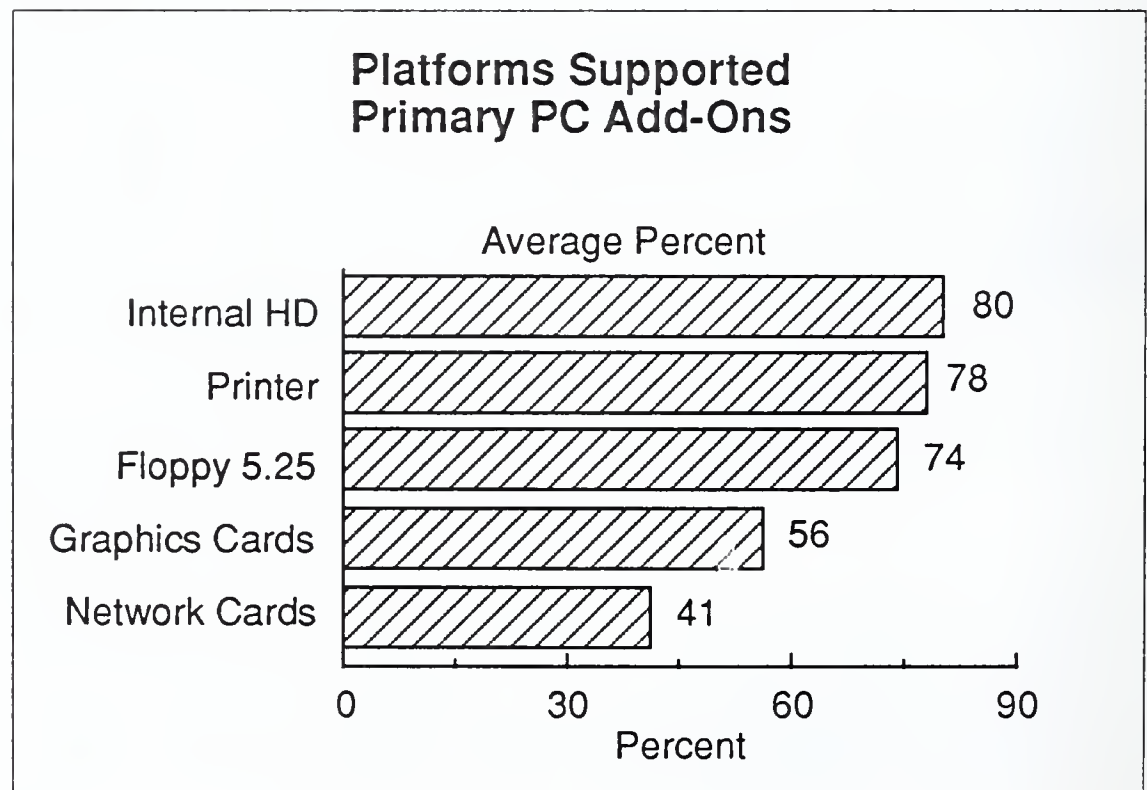
This sample indicates that on average, end users are operating with workstations that will support most of today's more advanced workstation- and communications-oriented software packages. Although exactly comparable data isn't available, INPUT's 1987 report on workstations indicated that the preponderance of the systems were operating below the 286 class. Also, considering the fact that there is limited software available that really leverages the 386 class machine, the 17% of the systems in that category suggest that there has been a rapid introduction over the past two years.

Not surprisingly, 70% of the Intel-based systems identified in the sample are IBM-label products. It was not possible to determine from the survey data exactly what percentage of the systems were actually PS/2s. However, the distinction is moot since less than 2% of the systems are actually using the OS/2 operating system, and are therefore utilizing few of the advertised advantages of the OS/2.

2. Primary PC Add-Ons

The survey also indicates that close to 80% of the systems have internal hard drives and 78% have their own local printing capability. Graphics and network cards were less common, but are present on between 40% and 60% of the systems. Exhibit IV-5 shows the distribution of primary "add-ons" for the typical PC utilized in the end-user computing environment.

EXHIBIT IV-5



With hard disk drives even more common than printers, and laptop machines now sporting in excess of 80K hard disk capability, it's hard to believe that only a few years ago, many were forecasting the demise of local storage on business workstations. Today it appears that several trends are working in the opposite direction.

- The multitasking requirements of all the newer PC-based operating systems require both significant amounts of memory and overlay disk storage capacity—these are most cost-effectively supplied at the workstation.
- Personal productivity software, most logically managed at the workstation, permits, and as currently configured in most instances, requires significant local storage capacity.
- The leading PC software companies have been mostly unsuccessful in developing LAN or network-based packages that permit effective sharing from file servers or other centralized storage facilities.

It is also debatable how strong the concept of centralized printing facilities will be in the future. The survey indicates that 78% of the systems utilized by end users currently have some sort of standalone print facility. Of these, about 80% are currently dot matrix, but the trend is clearly toward laser-jet printing. Newer versions of the "personal" laser-jet are already available at price levels equivalent to those of business-quality early 1980s dot matrix printers. As the tendency toward graphical interfaces grows, INPUT anticipates an even greater demand for local workstation printing capability of a quality level unheard of 10 years ago.

The survey also indicates that a variety of additional devices are currently being committed to end-user PCs. While none of these devices were present on more than 5% of the PCs in the sample, INPUT believes that there will be some growth in all of the following areas:

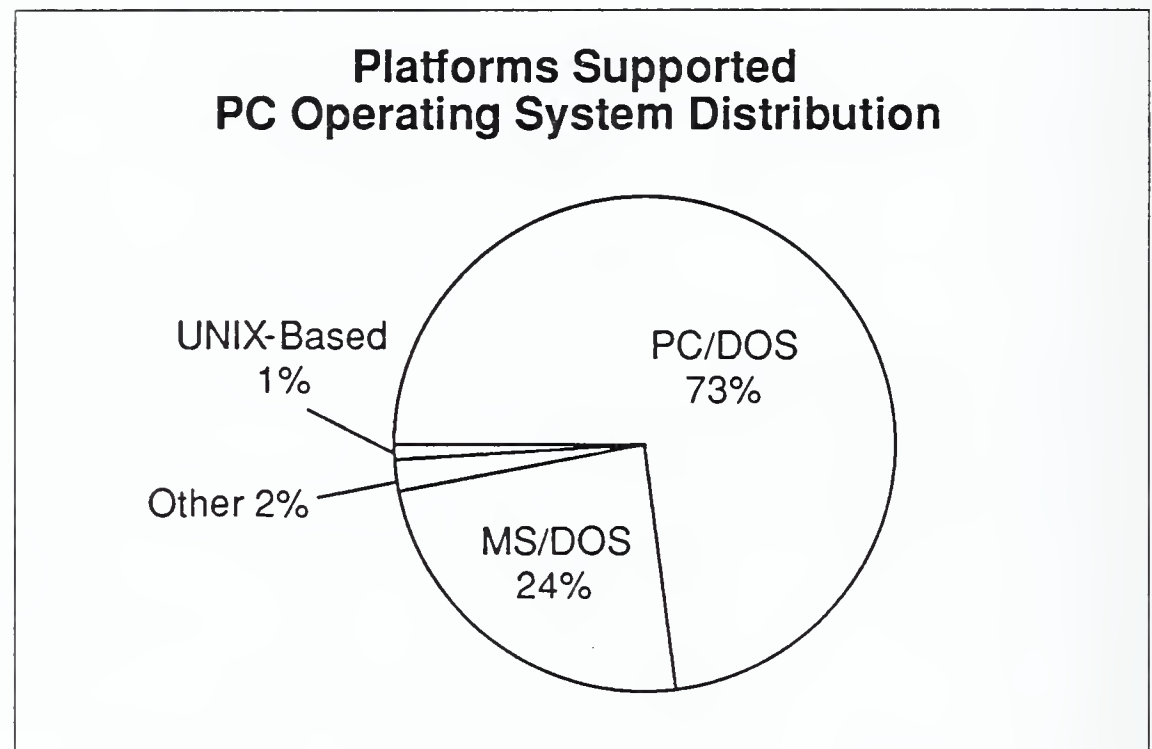
- Fax boards, though present on only about 1% of the systems in the survey, are clearly a coming thing.
- Plotters are present on about 3% of the systems, but in INPUT's view are likely to remain a small percentage in the general business environment as laser-jet technology is likely to meet most business graphics requirements.
- Scanners, like fax boards, are present on about 1% of the systems. While INPUT does not expect nearly the growth rate for scanners as it does for personalized printers, we could anticipate that about 10% of the PCs utilized by end users will have some type of scanning device within the next four years.

A more detailed discussion of anticipated changes in end-user PC configurations is included in Section 5.

3. PC Operating Systems

Exhibit IV-6 shows the distribution of operating systems utilized on the end-user PCs covered in the survey. Not surprisingly, DOS dominates with 73% of the systems utilizing IBM's version and 24% running Microsoft's. Only 1% are currently running some version of UNIX, and the 2% listed under "Other" is virtually 100% OS/2.

EXHIBIT IV-6



There are a number of implications of this distribution.

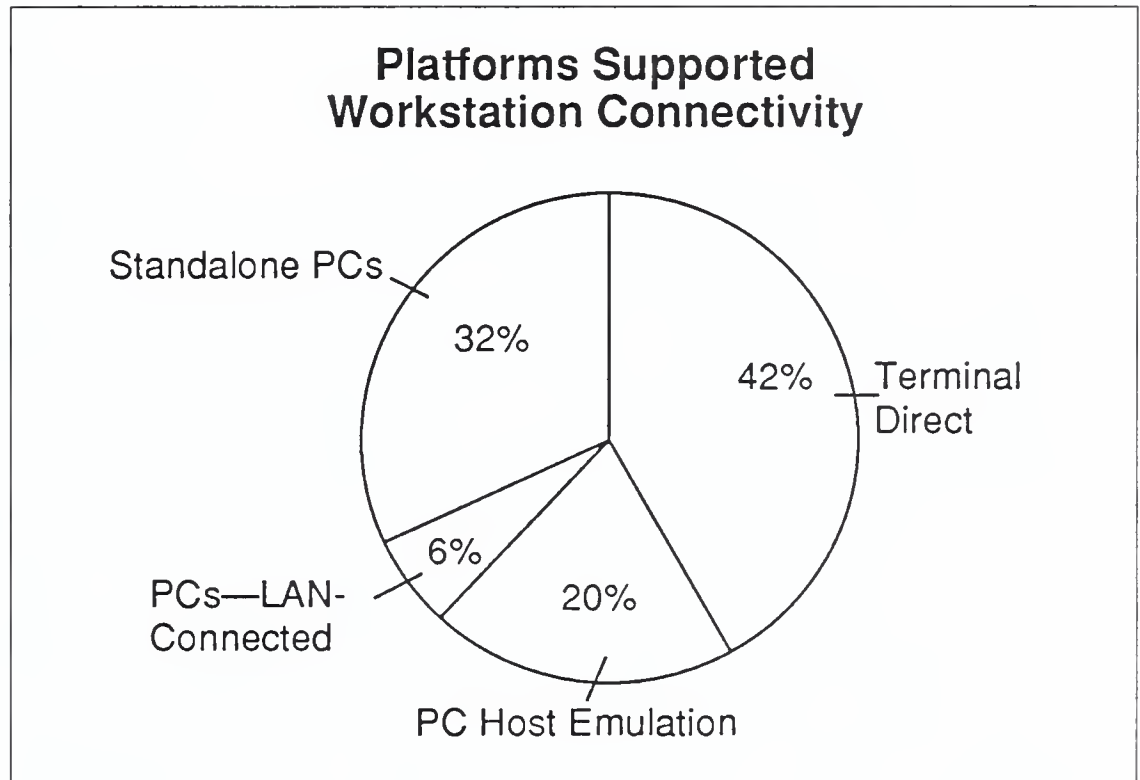
- Regardless of concerted efforts by IBM to move corporate end users to the OS/2 environment, little progress has been made to date. Even in situations where PS/2 hardware is in place, DOS is still the dominant operating system.
- It appears that UNIX is making its entry into the corporate world through the engineering and scientific community rather than the typical end-user shop.

INPUT believes that for the next two years there will be little change in the distribution of operating systems. Until end-user software is developed which leverages these more advanced platforms, few end users are going to be willing to make the investment in dollars and training that it will take to make the migration.

4. Workstation Connectivity

For corporate end users with either internal or external connectivity requirements, the dominant technology for the early eighties was the modem. This technology was rapidly followed by the introduction of terminal emulation cards, and in more recent years, LAN (local-area network) adapters. The survey performed for this study indicates that 68% of all end-user workstations are directly connected to a network capability of some type. Exhibit IV-7 shows the actual distribution.

EXHIBIT IV-7



INPUT had anticipated that the distribution would contain a higher percentage of LAN-connected PCs in end-user environments. There are probably a least two reasons why the percentage was smaller than anticipated:

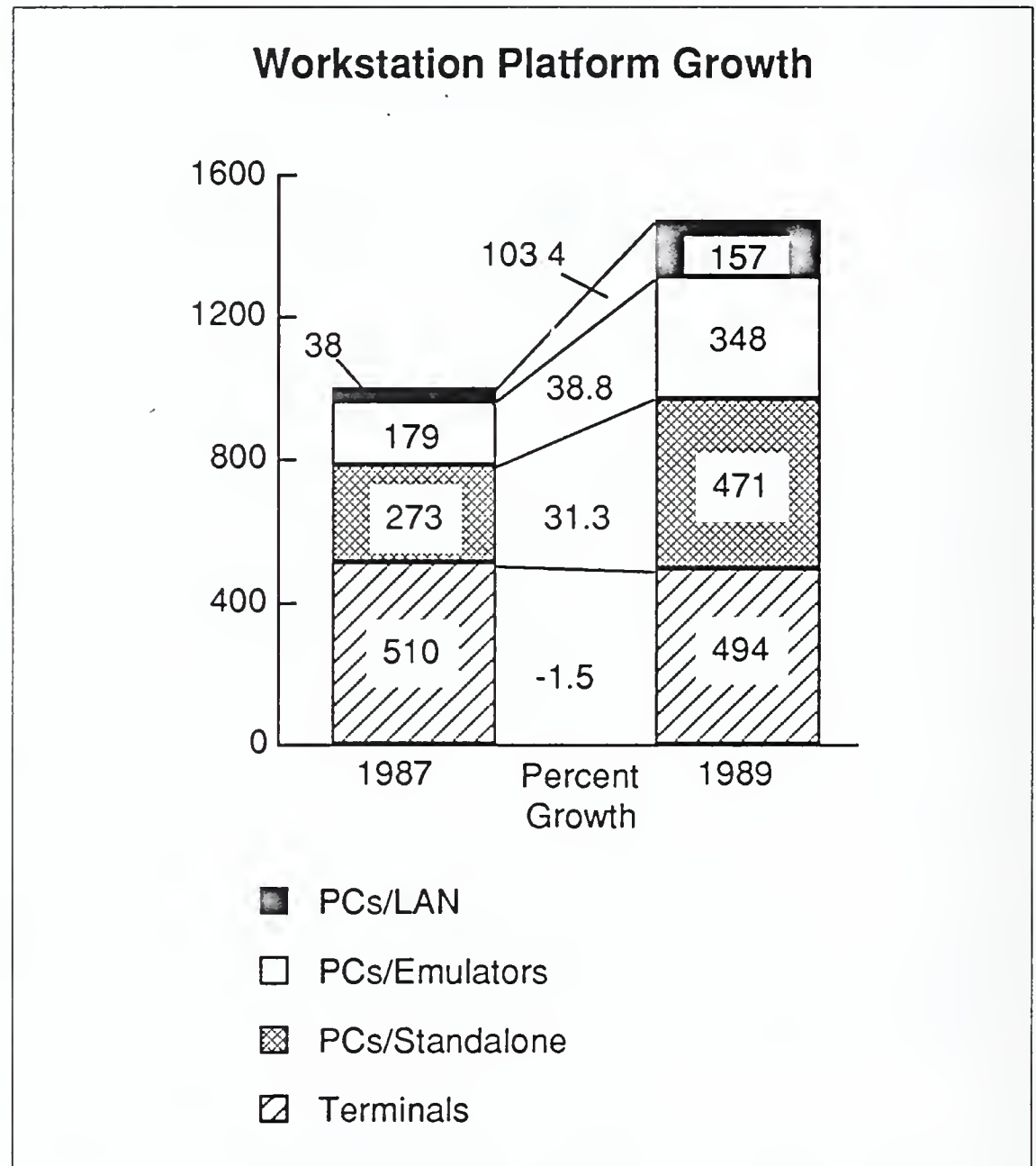
- Early LAN software offerings offered only primitive server functions, and required significant amounts of technical administrative support to keep them up and running.
- LAN-based applications-enabling products that end users had been accustomed to using on a standalone basis were late in being released, and frequently were fraught with problems.

Examining the data in more detail, it appears that while the average number of workstations connected to LANs is low, some respondents in the survey have totally committed to a LAN-based strategy. Several companies reported that virtually all their end-user PCs were connected through LANs. In all instances these companies tended to be the larger firms, some with as many as 700 workstations on LANs.

5. Connectivity Trends

Part of the survey dealt with how connectivity patterns have changed in recent years. Exhibit IV-8 shows the compound annual growth rates (CAGRs) for new end-user workstation installations by connectivity class between 1987 and 1989.

EXHIBIT IV-8



The numbers on the 1987 stacked bar represent the number per thousand of each class of new workstation installed in that year. The numbers on the right bar (1989) are the estimates of how many of each class of new workstation were installed in the same organization in 1989.

Over the two-year time period, the number of new end-user workstations in the typical company grew at a CAGR of 21.2%. As indicated in Exhibit IV-8, the number of traditional terminals installed for end users over the two-year period actually dropped at a CAGR of about 1.5%; the

installation rate of standalone PCs grew at a CAGR of 31.3%. The most significant growth has been in the area of directly connected PCs, utilizing either emulation or LAN cards.

Only 30 respondents provided any information regarding forecasted installations beyond 1989. A tabulation of their responses indicates that the growth rate of LAN and emulation connection will continue to dominate new end-user workstation installations. Clearly the tendency will be to give new end users some sort of network connection as part of the standard workstation.

Finally, the survey data indicates that approximately 11% of all the PCs currently installed in end-user environments have modems. There was no historical information available to establish whether the number of modems in the population is increasing or decreasing. In the beginning of the decade, modems provided the only form of connectivity available. Coupled with the right software, they provided both terminal emulation and outside connectivity. INPUT believes that it is unlikely that the number installed in corporate end-user environments is increasing at a significant rate, since clusters of LAN-based PCs can generally gain access to outside networks through gateways provided by LAN servers; and hard-wired emulation capability is more efficient and less trouble-prone than modem-based implementation of the comparable capability.

Clearly the most significant change in end-user platforms over the past five years has been the growth in the variety and number of options that end users have in accessing networks. As micro-based workstations become increasingly accepted as key platforms for the development of traditional applications through concepts such as cooperative processing, we can anticipate even more seamless solutions to connectivity for end users.

6. End-User Software (PC-Based)

The survey data on end-user software was collected for both mainframe and PC platforms. Respondents were asked to supply information on software packages utilized and the types of support that were supplied. Nine categories of PC software were examined. For each category, a number of options (packages) were presented, and respondents were allowed to add to the list as appropriate.

Exhibit IV-9 provides INPUT's analysis of the key PC-based packages being utilized in the four major categories: spreadsheet, word processing, data base and communications. It should be emphasized that the ranking is based on the types and depth of support being provided for end users on these packages, not the number of installations of each.

EXHIBIT IV-9

PC Software Ranked by Support Level

Function/Category	Rank/Package
Spreadsheet	1 Lotus 1-2-3
	2 Excel
	3 Symphony
Word Processing	1 WordPerfect
	2 Displaywrite
	3 Microsoft Word
Data Base	1 dBase
	2 Paradox
	3 RBase
Communications (Modem Bases)	1 Crosstalk
	2 Smartcom

There are few surprises in the list; however, a number of observations should be made:

- Excel appears to be gaining on Lotus, at least in terms of support provided by EUC organizations. Though its capabilities do not represent a revolutionary improvement over those of Lotus, INPUT believes that Excel will become even more widely utilized and supported as the migration occurs to operating systems that support windowing and higher-level graphical interfaces.
- Displaywrite ranks number two in the battle of the word processors, even though many would argue that its capabilities are below those of other products on the market. Its number two position is probably based on the fact that it is at least operative on multiple IBM platforms and is therefore a logical selection for large IBM shops. As IBM moves SAA from announcement to reality, INPUT believes that Displaywrite will hold its own in the rankings.
- Paradox suddenly appears as number two in the PC-based data base environments. With an original design based on the relational model, it has features and capabilities which should make it an even more attractive contender in the future.

Ashton-Tate has had a disappointing track record with recent releases of dBase, and the increased availability of resources for the further development and marketing of Paradox under Borland's umbrella should keep Paradox a front runner in the immediate future.

Other categories covered under PC software portion of the survey included CAD/CAM, CASE, 4GLs, graphics and desktop publishing. In most instances the survey data, in terms of number of respondents, was insufficient to draw general conclusions. However, a number of insights can be drawn in some of these areas.

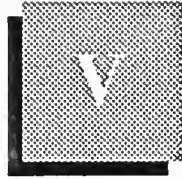
- **CASE**—As indicated in Exhibit IV-1, the number of EUC organizations providing support for CAD/CAM, CASE, and expert systems is between 15% and 50%. If we look at the responses for CASE only, the number drops to 15%. However, in those situations where EUC is providing support, it is a significant undertaking. There was no single software package that seemed to dominate the arena. However, the migration to PC-based rather than mainframe-based products will likely increase EUC's involvement in CASE in the future.
- **Graphics**—The Harvard graphics package dominated this area with packages like Storyboard and Diagraph also frequently mentioned. In general, however, these packages are not considered in the mainstream of end-user products. INPUT believes that as the graphical capabilities of packages such as Lotus 1-2-3, Word, Excel, etc., continue to improve, end users will increasingly rely on those capabilities, supplementing with separate graphics packages only in special situations.
- **Desktop Publishing**—Ventura and PageMaker are the runaway leaders in this area. INPUT believes that the capabilities being provided by newer releases of traditional word processing software packages will soon relegate the use of traditional desktop publishing software to highly specialized applications outside the realm of traditional end-user computing.

So although the variety of PC software being utilized by end users is quite broad, the eighty percent rule would indicate that the typical end user operating on a PC-based workstation today requires a spreadsheet, word processor and at least one connectivity package. Beyond these capabilities, the next most frequent requirement is for a PC-based data base system.



Issues and Future Trends





Issues and Future Trends

The previous chapter examined the services and technologies being provided by EUC organizations today. This chapter explores in greater depth some of the major issues that end-user computing is facing, and looks at some of the future trends that will have a high impact on the organization and role of end-user computing in the future.

Most of the data used in the preparation of this part of the analysis came from the last section of the survey, *Section IX—Trends and Issues in End-User Support/Computing* (See Appendix A). Other issues and trends presented in this chapter are the result of INPUT's analysis of the data from other parts of the survey. Where appropriate, the source of the information is noted in the analysis.

A

Platforms—Key Issues

The survey respondents' ranking of key issues involving platforms is contained in Exhibit V-1.

EXHIBIT V-1

Ranking of Key Issues—Platforms

- 1 Emergence of UNIX
- 2 Key decisions involving OS/2
- 3 Cooperative processing
- 4 Distributed data base management

For analysis purposes, INPUT believes that these four should really be consolidated into two. Items one and two on the list really deal with the whole issue of platform migration, items three and four with the integration of the end-user platform into more traditional elements of the corpo-

rate applications portfolio. Examining these issues from those two perspectives provides some significant insights.

1. Platform Migration

The issues surrounding UNIX and OS/2 have the same fundamental underpinnings. What next? Clearly, to meet future end-user requirements as well as to leverage the advantages of the microcomputer hardware currently on the market, some decision will need to be made regarding the next generation of operating system. For the vast majority of PC-based EUC organizations, this has been a non-decision to date. Migrating along the DOS path has been easy.

As the end-user hardware and software environment has gotten more complex, it has become increasingly difficult to migrate to new or replacement technologies in the end-user environment. The two primary reasons have been direct dollar costs and user inertia, with the latter being the most significant. In order to get a user to migrate, new capabilities will have to be revolutionary, not evolutionary. For a number of years, users have been investing their own time in the development of application templates for enabling software, such as spreadsheets and sophisticated word processing systems. Resistance to retraining and conversion from an emotional viewpoint will be significant. In companies where end users pay for their own hardware and software, there will also be the issue of cost.

INPUT believes that user resistance to PC operating systems conversion from DOS to either UNIX or OS/2 will be even higher than resistance to changes in applications packages such as spreadsheets and word processors. There are a number of reasons for such resistance:

- The average user has already learned how to put up with the idiosyncrasies of DOS. No matter what users are told about the virtues of newer operating systems such as OS/2, they would be hard-pressed to identify anyone who has converted who has achieved any significant advantages, given the lack of good applications or applications-enabling software designed to run under these new operating systems.
- Migration will require some massive upgrades in hardware for most companies. Unless IBM can figure out a way to give away the razors and make it up on the blades, it's unlikely that these upgrades will occur quickly.
- The direction of migration isn't totally obvious. Even for companies that are largely "blue," OS/2 implies a long-term commitment to SAA (Systems Applications Architecture). For companies considering the UNIX route... which UNIX? And to add to the confusion, we have another whole segment of the vendor community offering the extended bus as the answer.

In addition to the problems of selling end users on a conversion, there's the question of being capable of executing it. The technical skills required to deal with OS/2 or UNIX are clearly an order of magnitude greater than those required to deal with DOS. Many EUC organizations simply won't have the skills to support such conversion activities without significant internal investments in training and development.

Finally, end users are not likely to be a driving force in the migration from DOS to OS/2 or UNIX. It is more likely that corporate decisions regarding overall architectural standards will be the motivator. As end-user systems become increasingly reliant on network-based applications and the resulting need for compatible connectivity and data standards, end users and EUC organizations will have to act more in concert with overall architectural direction.

2. Platform Integration

Points 3 and 4 on the respondents' list of issues regarding platforms are also closely related. As the PC-based workstation is increasingly seen as the window into all applications environments, integration and compatibility will become compelling issues.

Growing involvement in mainframe and network-based applications is already underway for many of the more advanced EUC organizations. The pendulum will swing back to an increasing need to know about mainframe and network applications. Early in the days of EUC, the emphasis was on knowing about the centralized environment. After all, the PC simply didn't exist. Then standalone PCs took the center stage. In the future, it will be necessary to have an in-depth understanding of both environments and the evolving network and operating system protocols that link them.

As expressed by the survey respondents, cooperative processing and distributed data base applications are merely two manifestations of this need for integration. Certainly, traditional end users in most corporate environments will find themselves users of these types of applications over time. To accomplish that objective, the next generation of end-user platforms will need to provide more than simple mainframe terminal emulation.

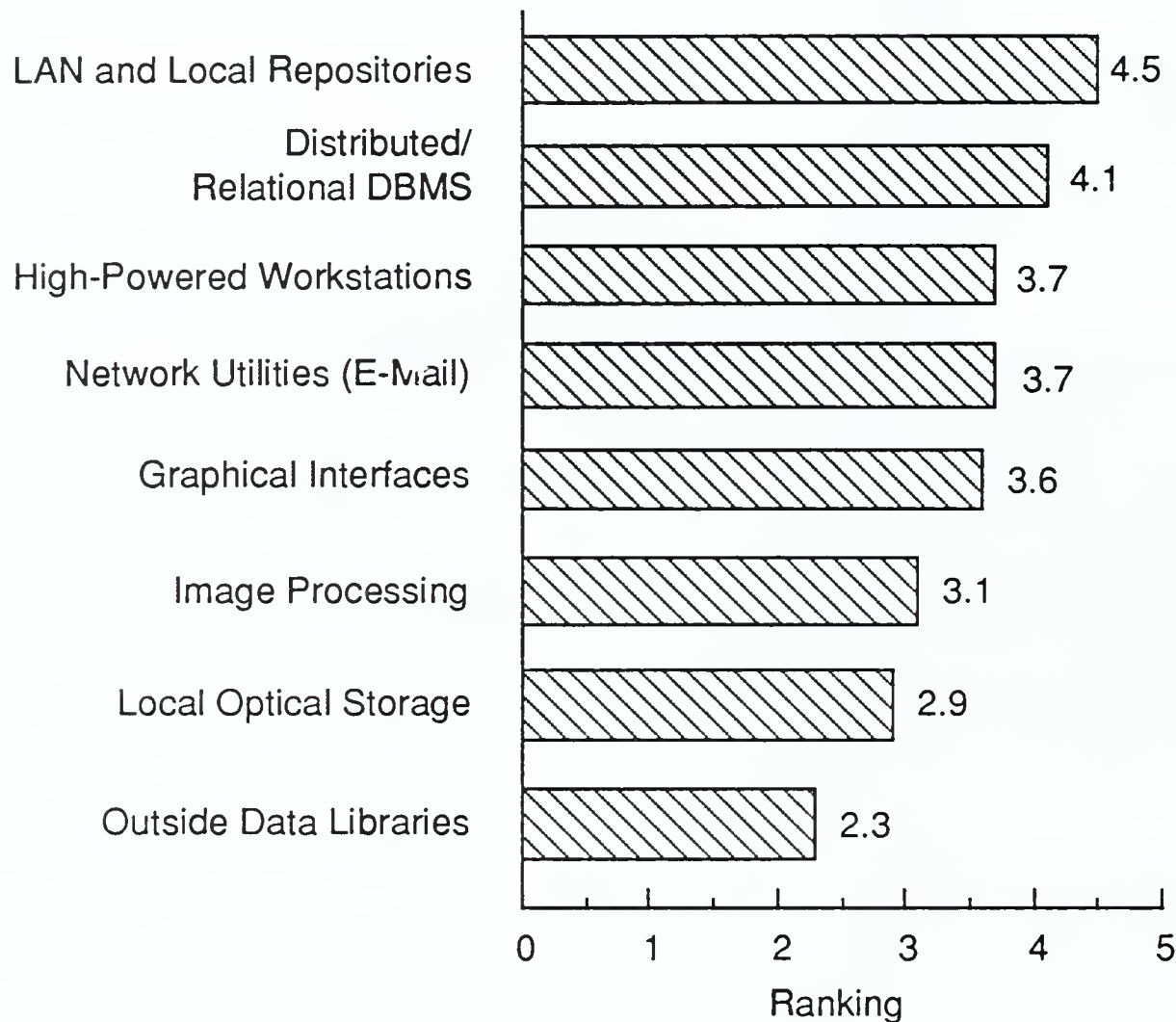
This will add another layer of complexity into the support equation.

B

Impacts of New Technologies

New technologies will also create some major issues for the EUC function. Survey participants were asked to rate a number of technologies on a scale of 1 to 5 (one being the lowest and 5 being the highest) with regard to their impact on end-user computing. The results of this ranking are contained in Exhibit V-2.

EXHIBIT V-2

Impact of New Technologies on EUC

LANs and local repositories and distributed relational data base management systems clearly top the list; and reflect in INPUT's view the same concerns and opportunities that were cited in sections A-1 and A-2 of this chapter. Clearly these technologies are creating new opportunities for end users. But successful deployment will require the migration to higher-level standardized operating systems, and the integration of individual end-user workstations into a larger network entity. The issue of integration also raises its head in the case of the third highest ranked technology, network utilities.

To successfully support the introduction and application of any of these high-impact technologies, a number of issues will need to be addressed.

1. Software Distribution

The sheer logistics of coordinating the distribution and installation of PC-based software using today's strategies are horrendous in companies

with larger end-user populations. Furthermore, as the requirement for connectivity and integration of applications sets increases, the need to have upgrades installed virtually simultaneously (or, minimally, on a well-thought-out basis) on all communicating workstations will only increase. The methodology and tools for accomplishing this magic act are not well developed. This situation is further aggravated by the fact that most of today's major software suppliers have been reluctant to acknowledge the need to provide software solutions to the problem, since their heritage and resulting design philosophy has assumed little interaction between personal computers (or the applications they support) and issues involving copyright and pricing strategy for large corporate clients have yet to be resolved.

2. Standardized Workstations

Over 60% of the companies surveyed have adopted the concept of a "standard" end-user workstation. The idea is to provide new end users with an integrated collection of hardware and software, and basic training to get them up and running. Most offer some variations on the basic standard to accommodate specific user requirements. While the concept works well for new users, few EUC organizations have a strategy for migrating longer-term end-users into the standard environment. The result is that support requirements continue to exist for software packages and hardware that lies outside the standard environment.

It is unlikely that this problem can be solved by EUC alone. It will take a concerted initiative between EUC and those organizations responsible for overall information technology architectural planning to install and carry a standard forward. Some organizations, such as American Airlines and Bank of America, are clearly moving in that direction; they are establishing one standard to support both end-user and traditional applications environments, and investing the money it will take to get there. However, they are the exception and not the rule at this stage of development.

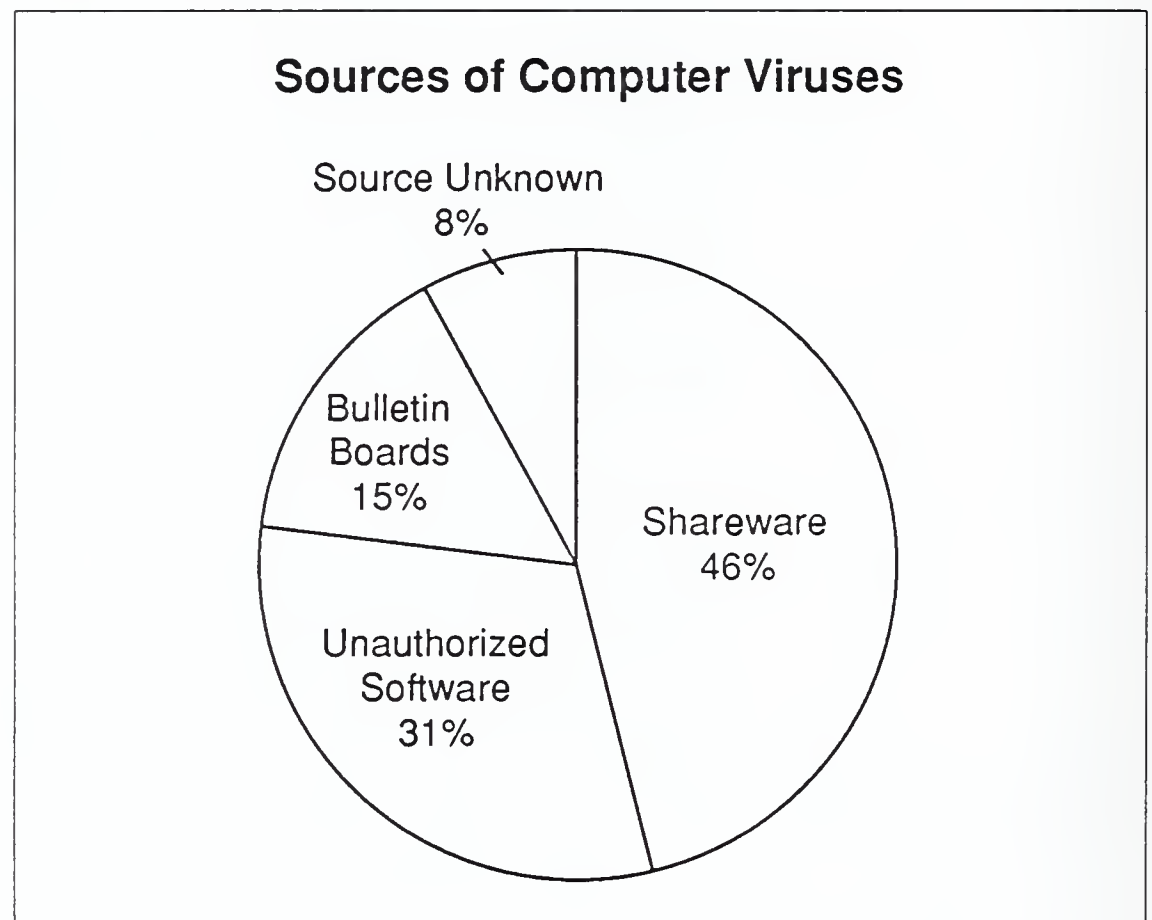
3. Data Security and Integrity

With hard drives as common as standalone printers, and significant data base capabilities being offered on platforms from the 286 class on up, it's clear that issues of data security and integrity will become a growing concern as we move into the next decade of network-based applications. INPUT doesn't believe that the trend to higher power and capacity is likely to cease, despite prognostications of diskless workstations. As these local PC-based workstations become increasingly integrated into LAN and other network-based applications, the complexity of managing security, as well as back-up and recovery, will require some unique and new approaches.

Approximately 22% of the PCs covered in the survey have some sort of hardware security device installed. However, preventing physical access to the hardware is only the first, and certainly the least sophisticated, form of protection.

Dealing with computer viruses is just one aspect of the growing security and data protection problem. Approximately 75% of the EUC organizations surveyed have taken steps of one kind or another to prevent the introduction of viruses into their environments. In one-quarter of the firms surveyed, the EUC organization has been called upon to investigate computer viruses. Analysis of these viruses indicated that the source is usually identifiable. Exhibit V-3 shows the distribution of sources based on the survey response.

EXHIBIT V-3



Although dealing with computer viruses is only one of many aspects of the data security and integrity issue, it has gotten management's attention. Over 57% of the respondents indicated that senior management has requested their organization to develop plans for dealing with viruses within the last year.

4. The Graphical Interface

In addition to the issues cited above, respondents saw graphical interfaces as a major technology opportunity. Though this capability is clearly related to resolution of the issues surrounding the future direction of operating systems, it is worthy of some additional comment.

Clearly, end users would like to move more quickly to graphical interfaces with effective windowing capability. However, INPUT believes that the rate of migration will not be as fast as some forecasters predict (or users would like), for a number of reasons:

- Fifty percent (See Exhibit IV-7) of the installed base of PCs in the hands of end users today are 286 platforms. Both the operating systems and applications-enabling packages that support graphical interfaces are not very responsive (some would say downright slow), running in a 286 environment. A full 33% of the platforms (8088/8086-based) cannot run these types of graphical environments at all. Consequently, there will have to be some significant hardware and operating system upgrades in the installed base before true graphical interfaces are the norm rather than the exception.
- With the exception of Excel, the most popular end-user software packages were not developed to run in these environments. Though INPUT believes that all major PC software companies will migrate their popular offerings to the graphical environment, they are unlikely to make that investment until they see a significant migration to the platforms that can use them.
- Thirty-eight percent of the PCs in the survey sample don't even have a CGA or EGA capability (the minimum requirement for moving toward a graphical interface).
- Finally, the applications and application-enabling software to leverage this capability, with limited exceptions, is simply not available.

C

Power Users

The subject of power users was also explored by the survey. Exhibit V-4 gives the vital statistics concerning this end-user phenomenon.

EXHIBIT V-4

Trends and Issues—Power Users

92%	Of EUC organizations support power users
28%	Report special service requirements
90%	Utilize power users in user organizations

INPUT has no definition for the term “power user,” yet survey respondents had few problems interpreting the questions on the subject. For purposes of this discussion, we will define a power user as an end user whose requirements and/or capabilities to utilize technology (most often

PC-based) far exceed those of the average user, and who frequently presses the limits of the existing technological capability.

From the point of view of EUC functions, the power user has traditionally been a problem. Reluctant to follow standards, demanding, and frequently more technically competent than all but the best of EUC support staff, power users have traditionally been considered trouble-makers. However, as the results of the survey point out, power users may be turning out to be a blessing in disguise.

Ninety percent of the EUC organizations participating in the survey indicated that they have begun to utilize power users as part of their overall delivery and support strategy. By soliciting participation in the end-user management process, many EUC organizations have been effective in utilizing power users to:

- Participate in new product evaluations
- Cooperate in the support activity by providing technical consulting and problem determination in their respective operating departments
- Participate as informed users in pilot studies and new product rollouts

INPUT believes that this “if you can’t fight ‘em, join ‘em” trend will continue to develop over the next several years. Certainly power users are not likely to simply go away. As more and more computer knowledge is migrated into the operating organizations of corporate America, new crops of power users will emerge. Utilizing this resource as part of the overall support and development of end users is an effective way to extend the capabilities of the EUC function to obtain broader coverage and user intelligence.

D

Decentralization— Impacts on EUC

INPUT recently published a major report on information systems management for the 1990s. One of the topics explored in this report, *The Future of Information Systems Management*, was the continued trend toward the decentralization of applications development in certain industry sectors. Leveraging this earlier research, this study explored the same topic from the viewpoint of the end-user computing manager. In a broad context, the EUC managers in the sample agree that the trend toward decentralization is underway.

- Over 60% have been observing a decentralization of the management of applications development within their respective firms.
- Of those that observe the decentralization phenomenon, 70% believe that it will have an impact on how EUC is managed within their firms.

While respondents were relatively neutral on whether the decentralization trend was positive or negative, most felt it was not necessarily negative, provided that:

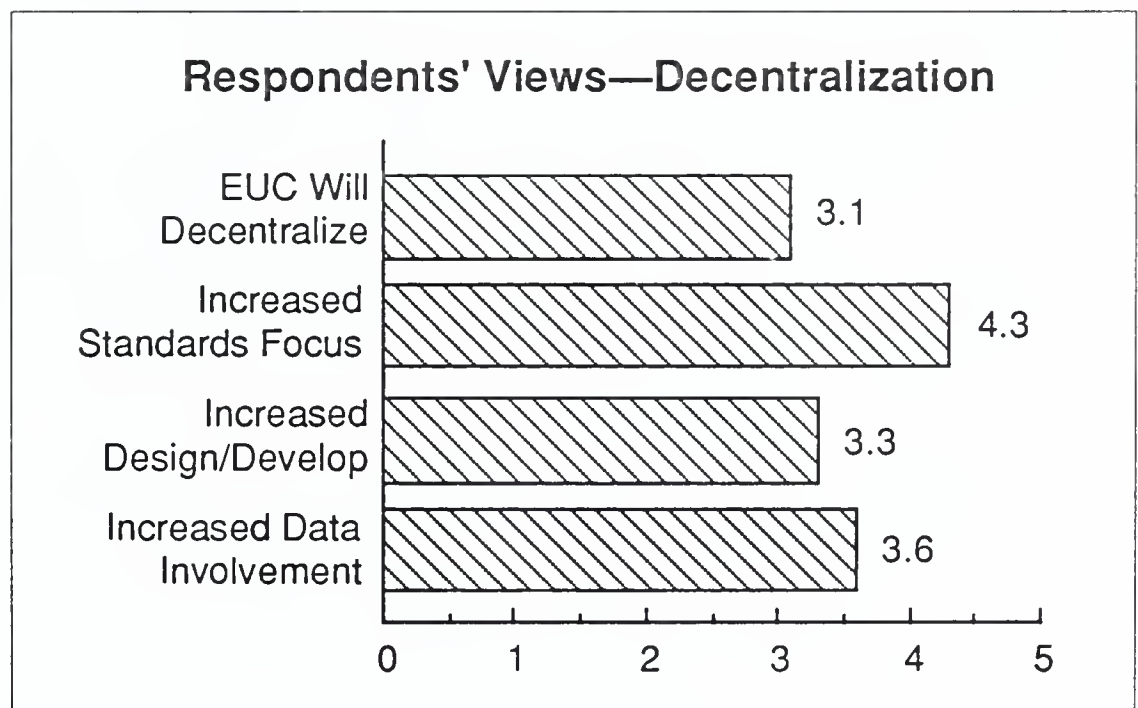
- Some mechanism stays in place in the information systems functions which has the capability and authority to develop, implement and control a strategy for the corporate information technology infrastructure
- Minimum standards for hardware, software and security are in place

Other aspects of the survey explored the potential impacts of the decentralization phenomenon on both the role and organization of EUC.

1. Impact of Decentralization on the Role of EUC

Respondents were also asked to comment on the specific impacts that this trend might have on end-user computing in their organizations. The potential areas of impact included both organization and responsibilities. For each outcome, respondents were asked to rate the impact on a scale from 1 to 5, with 1 being minimal impact, and 5 being maximum. The results are displayed in Exhibit V-5.

EXHIBIT V-5



The two most significant responses—increased involvement in standards and a stronger role in data management—imply that EUC sees itself more actively involved in the integration process. INPUT feels that decentralization will:

- Create new opportunities for cooperative efforts between decentralized applications development functions and the EUC organizations support-

ing individual operating units. These efforts will involve EUC more directly in the traditional development process, and consequently, in data-related activities.

- Promote the development of local standards within the context of overall corporate standards. To the extent that this localization is encouraged, EUC will need to work jointly with decentralized development organizations to evolve standards which meet both corporate and local objectives.

In general, decentralization of the traditional applications development function appears to pose both an opportunity and a threat. Localization of traditional development should provide opportunities for EUC organizations to work jointly with distributed development organizations to achieve integration of the end user and traditional processing capabilities through a single workstation. But to turn that opportunity into a reality, EUC organizations will need to step up to:

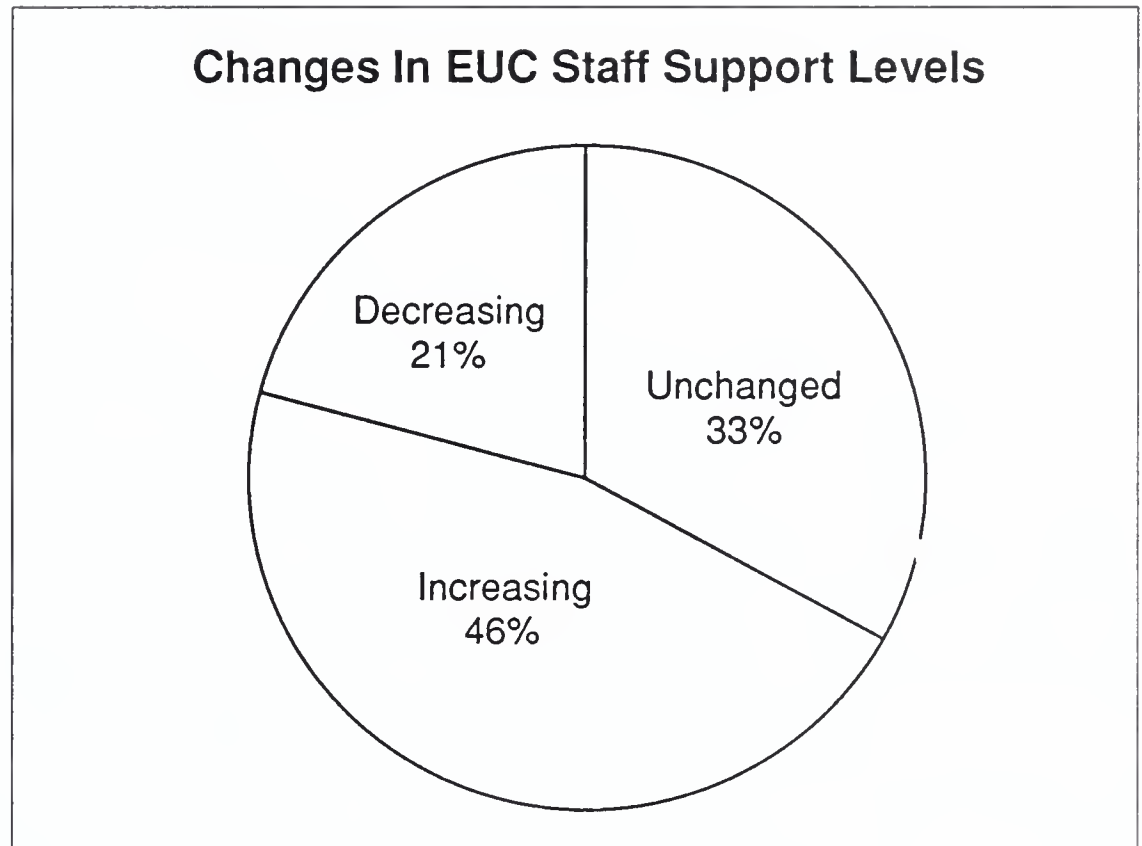
- Higher-level technical capabilities
- Greater emphasis on standards and connectivity
- Increased emphasis on project management skills
- Greater understanding of traditional applications and data environments

2. Impact of Decentralization on Organization and Staffing

On the organizational side, the majority of EUC organizations participating in the survey have not seen the decentralization of traditional development as having a significant impact on the total staffing for end-user support in their firms. The results of the survey (See Exhibit V-6) indicate that staffing for EUC support is either growing or remaining level for close to 80% of the survey participants.

The real question for the future is how that staff might be aligned in organizations where systems development is being decentralized. As was reported in Chapter II, over 70% of the EUC organizations surveyed report to a corporate-level information systems function and are currently centralized. Almost all have responsibilities for customer support or services as well as end-user technology and standards. For this class of organization, the decentralization of development currently underway in some major industry sectors could have a variety of organizational implications for EUC.

EXHIBIT V-6



- The EUC organizational structure could evolve in a manner parallel to systems development. The responsibility for end-user technology and standards would remain at a corporate level, as part of the corporate organization responsible for overall architecture and standards. The support activity would be decentralized along lines which parallel the decentralization of traditional development.
- For extremely small EUC functions, there would not be sufficient critical mass in terms of staff to effectively decentralize support into multiple units, leaving one or two options open:
 - The centralized EUC function would focus on end-user requirements for the corporate organization, phasing end-user support for operational units into their respective captive development functions.
 - The centralized EUC function would continue to provide support services throughout the entire corporation.

INPUT believes that the former is the more likely outcome. It seems unlikely that a small, centralized EUC staff would be able to compete with dedicated development activities that are likely to have greater impact as a result of their organizational co-location with the units they serve.

E

Summary of Major
Issues and Trends

Exhibit V-7 summarizes the major issues and trends which will confront EUC over the next three to five years.

EXHIBIT V-7

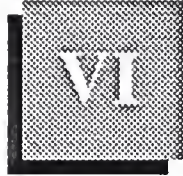
Major Issues and Trends	
Issue/Trend	Area of Impact
Integration	Data, applications, networks
Migration	Workstations, operating systems, user interfaces
Support	More sophisticated users, production applications
Security	Data, networks
Decentralization	Application development, data, operations

When EUC organizations will need to deal with each of these issues is or will be a function of their industry and state of evolution. In those companies where the penetration of information technology is high, EUC is already having to address these issues and trends. In other companies, the full impact has yet to be realized. In either case, it seems inevitable that the over the next several years, EUC will need to plan ahead to be able to meet both the challenges and opportunities that these issues and trends present.



Conclusions and Recommendations





Conclusions and Recommendations

While the challenges being faced by end-user computing will vary significantly between individual companies and industry groups, there are a number of general conclusions and recommendations that can be drawn from the research conducted in support of this study, in addition to those presented in preceding chapters.

A

General Conclusions

1. Integration

The complexity of supporting end users and the technology utilized in end-user computing are increasing as a result of the requirement for increased integration. Every indicator in the survey points in that direction.

- In the not-so-distant past, end-user support meant providing training and support to “individual” end users, primarily analysts, in applying technology to individual problem-solving. On the administrative side, the focus was on office systems. Today, the definition of end-user computing includes providing support for workgroup and departmental computing, and assisting in the creation of linkages to larger outside and internal data environments. These applications of technology require increasingly sophisticated levels of integration at the workstation itself, at the interface between the workstation and the network, and at the applications level.
- Office systems are no longer standalone applications. Even the departmental secretary is usually connected to some type of network, and shares computing resources, communications systems and data with both staff and line professional personnel.
- The individual professional, once satisfied with a set of tools selected to meet his specific analytical requirements expects to be able to utilize personal productivity, office, and network-based applications on a routine basis.

The result is that supporting this integrated end-user environment has and will become increasingly complex.

- The integration of technology is also growing at a tremendous rate. As few as five years ago, the dominant end-user workstation was a terminal connected to some sort of centralized timesharing environment. Today, the dominant platform is the personal computer, and the typical configuration provides a wealth of local as well as network-based software which requires integration. At the same time, the components requiring integration are increasing in complexity.
- Operating systems have evolved from DOS single-tasking control systems to OS/2 and UNIX multitasking environments.
- Communications capabilities have progressed from modem-based dial-up flat file transfers to workstation emulation and integrated interactive processing.
- Data base management systems have matured from flat file to hierarchical to full-fledged multiplatform distributed relational environments.
- User interfaces have developed from ASCII character displays to windowed graphical environments.

Finally, the business processes required to deliver support to this more complex integrated environment have stepped up by an order of magnitude as well.

2. Definition of End-User Computing

As a result of this drive toward integration, the distinction between end-user computing and traditional data processing is blurring. Some end-user computing groups surveyed in the study continue to operate within a charter which limits responsibilities to training, technical support, and hardware and software evaluations. Others are moving proactively into supporting end-user departments in the design and development of local systems.

INPUT believes that the trend will be toward supporting the planning, design and development of end-user-owned and operated systems that operate across integrated network environments. As EUC's role evolves in that direction, it is becoming hard to distinguish the services provided from those of the traditional systems development function. Whether EUC is a part of the corporate IS function, an operating division IS unit, or part of an end-user department, some organizational overlaps are likely to exist between EUC and the traditional development unit supporting the same departments.

It's too early to tell whether these overlaps will result in the re-integration of end-user and traditional applications development. Most of today's end-user computing organizations evolved from the concept of the "information center." Information centers were typically set up by the internal information systems organization to provide end users with access to subsets of the corporate data base for the purposes of one-time or special reporting requirements. User requirements were met by providing analytical personnel and tools to create extracts and reports for end users from existing data bases. In most instances, when the personal computer and fourth-generation languages evolved, the corporate information systems function perceived them strictly as user tools, and delegated the responsibility for their deployment to the information center. The result, probably not perceived or intended, is that these tools set the stage for end users to develop and manage their own applications systems; in many cases, that is exactly what has happened.

In many organizations, the EUC function has evolved to support end users in the development and management of their own production environments. So even though they are utilizing different technologies, many EUC staffs have been forced to develop the same kinds of management skills and methodologies that have historically been in the realm of traditional applications development.

3. End-User Architecture

At the same time, the corporate IS function has begun to recognize the personal computer and other "end-user" technologies as legitimate platforms for the development of integrated systems. This being the case, there is no doubt that a consistent architecture will need to be developed to support the overall drive toward integration. End-user architecture will need to merge with overall architectural planning.

4. EUC Organization

In most industries, traditional systems development is being decentralized to a divisional level to better meet strategic business unit needs. At the same time, there is overall strengthening of the role of centralized IS in policy, architectural planning, and standards. INPUT believes that this evolution, coupled with the requirements for an integrated architecture, will have an impact on the role and organization of EUC.

Most EUC organizations today focus on both technology and support. These organizations could be split along the same responsibility lines that are developing within the traditional IS function. Or, end-user computing as a separate organizational entity could be merged directly into divisional applications groups.

The direction of this organizational change will be dictated by a number of factors besides the driving force for integration. For example:

- In some organizations, end users have seen EUC as a responsive and helpful organization, and have held the traditional development function in somewhat lower regard. In these environments, it is entirely possible that the users will be willing to let responsibility for end-user architecture go to traditional IS, but will insist that traditional end-user support remain a separate entity.
- In other organizations, this cultural barrier is not an issue, implying that EUC will be re-integrated into the local development organization.

Regardless of the specific organizational impacts, INPUT believes that the continued existence of EUC as a more or less independent entity is unlikely.

Exhibit VI-1 summarizes the major conclusions discussed above.

EXHIBIT VI-1

General Conclusions	
Area of Impact	Primary Conclusions
Integration	Will demand increased sophistication of support Requires greater technological proficiency Involves EUC in production applications Will require better EUC management processes
End-User Architecture	Will be more workstation focused Requires integration with overall architecture Must have a network orientation
EUC Organization & Role	Will be impacted by changes in corporate IS Must respond to decentralization of development May merge with traditional development

B

Recommendations

Based on the research conducted in this and the other studies referenced in the report, INPUT has a number of recommendations for end-user computing organizations. They are organized into the following categories:

- Organizational development
- Technology
- User relationships

1. Organizational Development

- *Business Knowledge*—As the EUC function becomes more involved with the application rather than just the support of end-user technology, an understanding of the processes and objectives of the business being supported is essential. EUC organizations must seek to develop and reward this skill.
- *Technical Proficiency*—As pointed out in Section A of this chapter, the technical complexity of both the individual products and their integration into end-user platforms and networks is growing rapidly. EUC organizations should place renewed emphasis on upgrading their technical skills to meet the challenges of the emerging generation of technologies.
- *Project Management*—The demand for project management skills in the typical EUC organization of the late 1980s hasn't been great. However, as EUC takes a more active role in applications development, these skills will become essential. EUC organizations will need to actively seek professionals with these capabilities in order to meet their clients' future requirements.
- *Power Users*—Incorporate "power users" into the product evaluation, pilot testing and technology migration processes. The utilization of these potential assets in these types of activities leverages the resources available to EUC, and can potentially build support for EUC programs and plans within end-user departments.
- *Focus* —Most EUC organizations are simply too small to take on the "all things to all people" charters that many have tackled in the past. Support needs to be focused on a limited number of integrated product sets in the future, if EUC is going to be able to support the complex product and applications environments already evolving. Supporting three spreadsheets poorly, or for that matter more than two LAN environments, simply dilutes effectiveness. While the ultimate goal of a single standardized environment is not achievable or necessarily even optimal, superior skills at applying and supporting a minimum number of standard environments will help propagate whatever standards are set.

2. Technology

- *Standard Workstations* —As indicated above, it's unlikely that EUC on its own can achieve the development and enforcement of a standard workstation environment within a given corporation. However, EUC

should seek alliances with the corporate IS technology planning functions to bring about an integrated architecture which treats end-user computing platforms as part of an overall integrated architecture. This approach adds the additional clout of corporate IS to the standard's enforcement, and insures common approaches to communications and connectivity.

- *Technology Evaluation*—The opportunities to evaluate new technologies are endless, and can consume as many resources as are made available. INPUT recommends that EUC organizations work cooperatively with corporate technology and architectural organizations to limit the scope of ongoing evaluation to technologies which:
 - Are logical extensions of the capability offered by established standards
 - Provide opportunities for totally new applications concepts

In other words, once you've adopted a word processing or spreadsheet environment, there is little virtue in examining a new competitive offering unless the features are in fact revolutionary. Users won't migrate without protest unless the product offers them unique applications opportunities.

- *Technology Migration*—As pointed out in Chapter V, INPUT believes that there will be a growing resistance to migrating to new platforms and applications-enabling software on the part of end users. Yet this migration will be necessary in order to achieve the overall levels of integration that future applications environments will require. As is the case with the promulgation of standards, EUC will need to work with the corporate IS technology management function to cause this migration to occur. INPUT believes that effective migration to new standard environments can be facilitated by:
 - Minimizing financial penalties through subsidization of the upgrade process
 - Targeting organizations that can realize early benefits as environments for testing and tuning the migration process
 - Upgrading features and functions of cross-functional applications that will support all users of the targeted platform. Improvements in functionality of office, electronic mail, or personal productivity applications available on the target platform are good candidates for the kind of upgrades that will entice less enthusiastic end users to go along with the program.

- Providing well-thought-out conversion tools to assist end users in making the migration rapidly

3. User Relationships

- *Planning*—EUC should emphasize up-front planning and involvement in end-user projects. In other words, EUC should move from a reactive to a proactive role in its relationships with end users. Unless EUC understands both the general applications as well as end-user-specific systems objectives, the level of integrated planning required to support end users will be inadequate. In addition, this proactive posture puts EUC in a better position to direct new applications into the standardized environment.
- *Account Management*—Develop an account management scheme for maintaining information flows on user plans and developments. This approach implies visiting with end users when there is no “hot” support or project issue to discuss. If well-executed, an account management approach should result in EUC having an account plan for every major client, focusing on technology and training needs as well as future applications plans.

Fundamentally, all of these recommendations point to three strategies which INPUT feels should be adopted by EUC organizations to further increase their effectiveness for the 1990s. They are:

- Adopt a proactive approach which will lead to well-managed plans for dealing with end users’ development and support needs.
- Deal with technology on a focused basis; offer a limited set of integrated multifunctional end-user platforms that support identified application needs.
- Develop alliances with the corporate information systems function to develop an integrated architecture and migration strategy for end users.

Exhibit VI-2 summarizes the principal recommendations resulting from this study.

EXHIBIT VI-2

Recommendations for EUC*Organizational Development*

1. Infuse EUC personnel with the knowledge of their client's business.
2. Plan now to make overall investments in upgrading technical proficiency.
3. Encourage the development of project management skills.
4. Utilize "power users" as part of the EUC delivery process.
5. Focus on key support and technology areas.

Technology

1. Develop standardized integrated product offerings for end users.
2. Focus product evaluation on extensions to existing or revolutionary technology opportunities.
3. Develop migration plans jointly with and in support of an overall corporate architecture.

User Relationships

1. Move from a reactive to a proactive posture through joint planning with end users.
2. Utilize account management concepts to strengthen user relationships.

C

Closing Thoughts

EUC organizations will face new challenges in the 1990s. All indicators point to the requirement for higher level technical skills as the demand for integration of sophisticated technologies at the end-user platform increases. Integration of the end-user platform into the general network environment will also increase the requirements for competence in technologies that many EUC organizations simply do not have today.

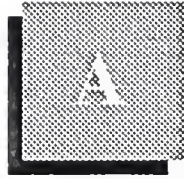
Furthermore, as EUC becomes increasingly involved with workgroup and production applications, there will be a demand for more sophisticated management processes and skills. Greater emphasis will need to be placed on project and data management capabilities, as well as on applications planning, all of which implies a closer relationship with the traditional systems development function and greater knowledge of end users' business operations.

Though the challenges are great, the opportunities to make contributions should be even greater for those end-user computing organizations that can meet the requirements.



Appendix: ICI Annual Survey





Appendix: ICI Annual Survey

The following survey was conducted by the Information Center Institute (ICI) of Dallas Texas. The survey was prepared jointly by INPUT and ICI to meet the mutual objectives of understanding the current status and major trends evolving in the area of end-user computing, and forms the basis upon which this report was prepared. Some of the data was collected to meet specific purposes of the Institute and its members, and was not available to INPUT for its use in this report. Specifically, responses were coded with numbers to mask the names of the specific institutions participating in the survey. Also, all information dealing with the salary survey portion of the questionnaire was tabulated by and for ICI exclusively.

INPUT would like to express its appreciation to the ICI and its membership for its participation in this cooperative effort.

Survey Purpose:

ICI is a membership organization whose members are the decision-making managers responsible for purchasing or determining the types of hardware and software to be purchased and utilized in end-user computing, defining and providing the amount and types of support those end users will receive, and evaluating and responding to the changing needs of their end users. These managers often report directly to the Director of Information Services.

ICI provides support services to these managers. Those support services included a "hotline" service, timely and informative publications dealing with the issues facing end-user computing support groups, and conferences. This survey is part of the benefits provided.

End-user computing and the Information Centers that support them have existed for at least fifteen years and are at a critical point of evolution. This survey is designed to capture the trends and direction of that evolution and thereby provide valuable and thought-provoking input to end-user support managers. It seeks to identify new and confirm known common trends in services afforded to end users within the economic sectors of industry, commerce, government, and academia. Those trends then provide our members with the information that confirms present operations or ideas and justification for change.

I. Company Profile

This survey is intended to measure end-user computing support services progress within particular economic sectors such as industry, commerce, government, education, financial services, hospital services, transportation, retail, federal governments, municipalities, etc. It would be helpful, in this section, to concentrate on your entire organization, not just the section you support. In the balance of the survey you will be identifying your area of responsibility.

Primary Business/Industry: _____

Secondary Business/Industries:

Company Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Total number of employees: _____

Estimated total number of microcomputers: _____

Estimated total number of terminals: _____

Name of person(s) completing this survey: _____

Name(s)	Title	Phone
_____	_____	_____
_____	_____	_____
_____	_____	_____

II. Area of Service

In this section, please concentrate on your area of responsibility within the total organization.

1. Does your end-user support group provide services for the entire organization?
Yes ____ No ____

If yes, please skip the remaining questions in this section and proceed to section III, End-User Support Organization/Objective.

If no, what portion of the entire organization is served? (Check all that apply)

Finance	_____
Manufacturing	_____
Engineering	_____
Marketing	_____
Sales	_____
Research and Development	_____
Distribution	_____
Executive Offices	_____
Other (Please indicate functional department(s))	_____

2. What is the total number of employees for which your support group provides service?

Total number of employees: _____

3. What is the total number of devices, micros/terminals, that your group supports?

Total number of microcomputers: _____

Total number of terminals: _____

4. What is the average number of employees per device?

Users per microcomputer: _____

Users per terminal: _____

III. End-User Support Organization/Objectives

This section is intended to obtain information regarding where your support group is positioned within the organization you support; the makeup of your group; staffing levels; and whether end-user computing services are centralized, decentralized, or a combination of both.

1. Your end-user computing support group is referred to as:

Information Center _____
 Solution Center _____
 End-User Support Center _____
 End-User Computing _____
 Other (Please specify name) _____

2. Are all the end-user computing support services provided to end users by your group, or are there other groups that provide service?

All are provided by personnel in my group _____
 Some services are provided by another group _____

If some services are provided by other internal groups or persons, please list those groups or persons and services provided:

3. What were the defined goals or charter your group was set up to achieve?

Have these changed? Yes _____ No _____

If yes, how? _____

4. How do you expect your group's goals or charter to change in the next 1 to 3 years?
- _____
- _____
- _____
5. What are the three major issues that you expect your group to face in the coming years?
- a. _____
- _____
- b. _____
- _____
- c. _____
- _____
6. Number of years that your support group has been in existence?
Number of years: _____
7. What is the present number of full-time equivalents in your support group that are providing end-user support services?
Total FTEs: _____
8. Do you utilize part-time employees in your services group? (For purposes of this question, outside services should not be considered.)
Yes _____ No _____
- If yes, what specific functions do they perform?
- _____
- _____
9. Is your group responsible for other activities besides end-user computing support?
Yes _____ No _____

10. What type of positions comprise your end-user support staff?

Title: _____

Number of personnel with this title: _____

Yearly salary range: _____ to _____

Responsibilities: _____

Full-time _____ Part-time _____

Title: _____

Number of personnel with this title: _____

Yearly salary range: _____ to _____

Responsibilities: _____

Full-time _____ Part-time _____

Title: _____

Number of personnel with this title: _____

Yearly salary range: _____ to _____

Responsibilities: _____

Full-time _____ Part-time _____

Title: _____

Number of personnel with this title: _____

Yearly salary range: _____ to _____

Responsibilities: _____

Full-time _____ Part-time _____

11. Does your group have a manager who is devoted to just end-user computing service?
Yes _____ No _____

If yes, who does the manager report to?

CEO _____

CFO _____

V.P./Director of Information Services _____

Division head (please specify name of department) _____

Other (Please specify) _____

12. Does your end-user support group offer services outside of your company?
Yes _____ No _____

If yes, what types of services are offered?

If yes, have these services been profitable?

Yes _____ No _____

If yes, have these services changed your group from being a cost center to a profit center?

Has changed it to a profit center _____

Has remained a cost center _____

Would be profit center regardless _____

13. Has the number of positions responsible for end-user support increased or decreased in the last year?

Increased _____
 Decreased _____
 Unchanged _____

If the number has changed, what are the reasons?

Increase in users supported _____
 Decrease in users supported _____
 Increase in services provided _____
 Decrease in services provided _____
 Transfer of more support services to functional departments _____
 Reorganization of support group _____
 Other (please specify reason for change in number) _____

14. Has there been any trend in your organization to decentralize the user-support group into the user departments?

Yes _____ No _____

If yes, has this resulted in a smaller central support group or the elimination of a central group?

Smaller central group _____
 Central group eliminated _____
 Neither _____

IV. Budgeting/Financing

This section is designed to explore the way your support organization is financially supported within your organization and the level of financing provided.

1. Does your end-user support group have its own annual budget?
Yes ____ No ____

If yes, what is that budget? _____

If the budget is not dedicated to the end-user support group, what is the amount spent on end-user support services?

Amount spent: _____

2. Does your end-user support group utilize a chargeback system to the departments it serves?
Yes ____ No ____

If yes, please describe: _____

If yes, do these charges completely cover the cost of your end-user support group?
Yes ____ No ____

If no, which services are charged back?

3. What portion of the total spent on end-user support is spent in the following areas?

Services

Percentage Spent

Hardware for end users	_____
Software for end users	_____
Hardware for support group	_____
Software for support group	_____
Training for end users	_____

If available, please break out the makeup of the above training percentage:

Classroom training of end users by internal personnel	_____
Classroom training of end users by external personnel	_____
Computer-based training packages	_____
On-on-one training of end users	_____
Training of support group staff	_____
Outside consulting services	_____
Internal marketing (newsletters, etc.)	_____
Publications	_____
Outside conferences, meetings	_____

V. Type of End-User Computing Being Done

This section is designed to determine the type of end-user computing that is being done within your company.

Type of Computing	Being Done <u>Now</u>	Planned in the <u>next year</u>	Internal Support <u>Provided</u>	No Support <u>Provided</u>
1. Office automation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. E-mail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Word processing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Spreadsheets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Presentation graphics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Data bases (internal)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. Access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Input	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Data bases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Expert systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. CASE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. 4GL applications development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Desktop publishing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. CAD/CAM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Other (please list)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

VI. End-User Support Services

This section is designed to determine what type of end-user support services are being provided to your end users.

1. Please indicate below the type of services that are being provided to your end users by your group, other groups in your company, or outside services.

Type of Service	Provided By Your Group Now	Provided By Another Internal Group	Provided By Outside Source/ Service
Evaluate software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluate hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set software standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consult on software purchases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consult on hardware purchases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Purchase software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Purchase hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offer employee micro purchase plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
System integration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Install micros/terminals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Move micros/terminals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintain micros/terminals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardware problem solving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software problem solving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assist in applications design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Type of Service	Provided By Your Group Now	Provided By Another Internal Group	Provided By Outside Source/ Service
Design applications/systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Train end users in applications design/development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Executive information system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offer automated referral system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offer library services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offer library research services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Publish newsletter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide data extracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loan micros/terminals to end user	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide access to external data bases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide user hotline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have end-user council	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End-user applications software training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. What type of training services are provided and what methods are utilized?

Video _____
 Formal classroom _____
 One-on-one _____
 Computer-based training (micro) _____
 Computer-based instruction (mainframe, mini, etc.) _____
 Other: (please specify) _____

None provided _____

3. What hardware facilities do you have available for training?

Training area with micros _____

Training area with terminals _____

Shared resource center _____

Other: (please specify)

None offered _____

4. What percentage of training services are offered by internal versus external resources?

Internal %: _____ External %: _____

5. If training services are provided, do you offer standard training classes?

Yes _____ No _____

If yes, please list classes provided:

_____	_____
_____	_____
_____	_____

VII. Hardware Supported

This section is designed to determine the type of hardware and vendors that are presently being utilized by your end users.

1. Please indicate the types of hardware and operating systems that are presently being utilized by your end users and supported by your group.

Vendor	Model	Operating System	# of Devices
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. Please estimate the total number of the following configurations that have been, are, and will be supported by your group.

Configuration	Year-End '87	Year-End '88	Est. Year-End '89
Terminals	_____	_____	_____
PCs emulating host	_____	_____	_____
PCs on LAN	_____	_____	_____
Standalone PCs	_____	_____	_____
Other	_____	_____	_____

3. Please estimate the total number of LANs installed now and estimate the number to be installed in the coming year.

Type of LAN	Total Now	To Be Installed This Year
PC Network	_____	_____
Novell	_____	_____
3Com	_____	_____
Token Ring	_____	_____
TOPS	_____	_____
Others:	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

4. Do you have a standard hardware configuration that is assigned to different levels/classifications of employees?
Yes ____ No ____

If no, please explain how hardware is assigned:

5. Please indicate the type of peripherals or add-ons that are commonly purchased for user systems and the percentage of systems that they are placed in.

Type of Peripheral/Add-ons	Percent of Systems Placed In
Modem	_____
Plotters	_____
Memory expansion cards	_____
Emulation boards	_____
Network cards	_____

Type of Peripheral/Add-ons	Percent of Systems Placed In
CGA boards	_____
EGA boards	_____
Multifunction boards	_____
Floppy drive - 5.25"	_____
Floppy drive - 3.5"	_____
Hard disk (internal)	_____
Hard disk (external)	_____
Mouse	_____
Light pen	_____
Accelerator boards	_____
Hardware security devices	_____
Fax boards	_____
Scanners	_____
Printers	_____

6. Please list the types of printers that are commonly purchased:

Type of Printer	Vendors	# Presently
Dot matrix (9 pin)	_____	_____
Dot matrix (24 pin)	_____	_____
Daisy wheel	_____	_____
Laser	_____	_____
Color	_____	_____
Inkjet	_____	_____

VIII. Software Supported/Utilized

This section is designed to determine what types of software packages are being utilized and the level of support being given.

Please indicate the types of software that are being supported or utilized and the level of support that is provided, using the numerically keyed table below (indicate all values that apply).

- 1 = Classroom training
- 2 = One-on-one training
- 3 = Phone support
- 4 = Computer-based instruction (provided with package)
- 5 = Computer-based instruction (third-party source)
- 6 = All of the above
- 7 = No support provided, but used widely

Micro-Based:

Type of Package	Package Name	O/S	Level of Support
-----------------	--------------	-----	------------------

Spreadsheets:

Lotus 1-2-3	_____	_____
Excel	_____	_____
Multiplan	_____	_____
Supercalc	_____	_____
SPSS PC	_____	_____
Symphony	_____	_____
Jazz	_____	_____
Quattro	_____	_____
Other:	_____	_____

CAD/CAM:

CadVance	_____	_____
Boeing Graph	_____	_____
Generic CAD	_____	_____
AutoCAD	_____	_____
FastCAD	_____	_____

Type of Package	Package Name	O/S	Level of Support
CAD/CAM:	Cadkey	_____	_____
	DataCAD	_____	_____
	CADmax	_____	_____
	Arris	_____	_____
	Other:	_____	_____
Word Processing:	Microsoft Word	_____	_____
	WordPerfect	_____	_____
	DisplayWrite	_____	_____
	Volkswriter	_____	_____
	Q & A	_____	_____
	PFS: Write	_____	_____
	Multimate	_____	_____
	Wordstar	_____	_____
	Samna	_____	_____
	Sprint	_____	_____
	Other:	_____	_____
Communication:	Crosstalk	_____	_____
	Smartcom	_____	_____
	Procomm	_____	_____
	Other:	_____	_____

Type of Package	Package Name	O/S	Level of Support
Data Bases:	dBase	_____	_____
	RBase	_____	_____
	DataEase	_____	_____
	Q & A	_____	_____
	Paradox	_____	_____
	Reflex	_____	_____
	Dataflex	_____	_____
	Other:	_____	_____
CASE:		_____	_____
4GLs		_____	_____
Graphics:	Harvard	_____	_____
	Diagraph	_____	_____
	Dr. Halo	_____	_____
	Signmaster	_____	_____
	PFS: Graph	_____	_____
	Storyboard	_____	_____
	GEM	_____	_____
	Micrographics	_____	_____
	PC Paintbrush	_____	_____
	MacPaint	_____	_____
	MacDraw	_____	_____
	Other:	_____	_____

Type of Package	Package Name	O/S	Level of Support
Desktop Publishing:	Ventura	_____	_____
	PageMaker	_____	_____
	GEM	_____	_____
	PFS: 1st Publish	_____	_____
	Other:	_____	_____
Mainframe-Based:	ADF	_____	_____
	ADS	_____	_____
	ADRS	_____	_____
	APL	_____	_____
	CAFS	_____	_____
	CUFFS	_____	_____
	DATATREIVE	_____	_____
	DBII	_____	_____
	DMS	_____	_____
	EASYTRIEVE	_____	_____
	EIS	_____	_____
	EMPIRE	_____	_____
	EXPRESS	_____	_____
	FCS-EPS	_____	_____
	FINAL	_____	_____
	FOCUS	_____	_____
	INFORMATION	_____	_____
	EXPERT	_____	_____
	INTELLECT	_____	_____
	GATEWAY	_____	_____
	GIS	_____	_____
	IFPS	_____	_____
	SYS 34 Utilities	_____	_____
	LINK	_____	_____
	MANTIS	_____	_____
	MAPPER	_____	_____
	MARK IV	_____	_____
	NOMAD	_____	_____
	ON-LINE ENGLISH	_____	_____
	ORACLE	_____	_____
	PLANCODE	_____	_____
	PPQFS	_____	_____
	QBE	_____	_____

Type of Package	Package Name	O/S	Level of Support
	QWIK QUERY	_____	_____
	RAMIS II	_____	_____
	RPG II or III	_____	_____
	SAS	_____	_____
	SIMPLAN	_____	_____
	SQL	_____	_____
	STAIRS	_____	_____
	SYSTEM W	_____	_____
	XSIM	_____	_____
	Other	_____	_____

IX. Trends and Issues in End-User Support/Computing

This section is designed to explore specific topics in end-user computing and support.

A. Power Users

1. Does your support group have to provide support to “power users”?
Yes ____ No ____

If yes, do these users utilize a disproportionately large or small share of your support group’s services?

Large ____ Small ____ No difference ____

2. Do you utilize “power users” in the user departments to supplement the services that you provide?
Yes ____ No ____

If yes, are there services provided solely by your group without support by “power users”?
Yes ____ No ____

If yes, please identify those services:

3. Within the past year, were there any services that were requested by your users that you refused to support?
Yes ____ No ____

If yes, what were those services?

4. What are some of the unique support services that have been requested by your “power users”?

a. _____
b. _____
c. _____
d. _____

5. Have you experienced a problem with “power users” introducing to end users software that is not supported or certified by your group?

Yes ____ No ____

If yes, how have or will you be addressing this problem?

6. Have you experienced a problem where “power users” have obtained hardware or software that exceeds their needs to perform their normal job functions?

Yes ____ No ____

Hardware ____ Software ____ Neither ____

If yes, how have or will you be addressing this problem?

B. Computer Viruses

1. Has your group been called on to deal with a computer virus(es) on your users’ systems?

Yes ____ No ____

If yes, were you able to determine the source of the virus?

Shareware _____
 Bulletin board _____
 Unauthorized copy of software _____
 Internal personnel _____
 Other (please specify) _____

Unable to determine source _____

2. Have you taken steps to prevent the introduction of a virus(es)?
 Yes _____ No _____

If yes, what steps have you taken?

- a. _____
 b. _____
 c. _____

3. Has your management approached you regarding viruses, in light of the recent media coverage?
 Yes _____ No _____

C. Future Trends

1. In many industries there is a clearly a trend toward the decentralization of the traditional applications development function to operating divisions.

a. Is this the trend within your organization?
 Yes _____ No _____

b. Do you believe the trend will impact end-user computing?
 Yes _____ No _____

c. If so, how?

2. Whether or not traditional applications development decentralizes, it is likely that the role of end-user computing will change over the next five years. The following statements describe some possible scenarios. Please indicate on a scale of 1 - 5 (1 = Low Impact, 5 = High Impact) your view of the degree to which these statements are likely to be true.
- a. End-user computing will also decentralize.
 - b. The role of centralized end-user computing will increasingly be on standards, hardware and software selection and technologies that manage the interfaces between end users and integrated information networks.
 - c. End-user computing will become more directly involved in supporting the end user in the design and development of what would have been traditionally considered "production" systems.
 - d. End-user computing will become more involved in the specification and management of general purpose data environments.
 - e. Primary management for the direct user support component if end-user computing will move to the departmental level.
 - f. End-user computing and the traditional systems development organizations will merge into a single applications/user support function.
3. On a scale of 1-5 (1 = Low Impact, 5 = High Impact) please give your view of the importance of the following technologies, in terms of their impact on end-user computing:
- a. High-Powered Workstations _____
 - b. Distributed/Relational Data Bases _____
 - c. Graphical Interfaces _____
 - d. Electronic Mail/Network-Based Utilities _____
 - e. Local-Area Networks and Data Repositories _____
 - f. Outside Data Libraries _____
 - g. Local Optical Storage _____
 - h. Image Storage and Retrieval _____

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2. Please indicate your reason for reading this report:

- | | | |
|---|---|---|
| <input type="checkbox"/> Required reading | <input type="checkbox"/> New product development | <input type="checkbox"/> Future purchase decision |
| <input type="checkbox"/> Area of high interest | <input type="checkbox"/> Business/market planning | <input type="checkbox"/> Systems planning |
| <input type="checkbox"/> Area of general interest | <input type="checkbox"/> Product planning | <input type="checkbox"/> Other _____ |

3. Please indicate extent report used and overall usefulness:

	Extent		Usefulness (1=Low, 5=High)				
	Read	Skimmed	1	2	3	4	5
Executive Overview	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Complete Report	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part of Report (_____ %)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. How Useful was:

- | | | | | | |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Data presented | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Analyses | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Recommendations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. How useful was the report in these areas:

- | | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Alert you to new opportunities or approaches | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cover new areas not covered elsewhere | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Confirm existing ideas | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Meet Expectations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

6. Which topics in the report were the most useful? Why? _____

7. In what ways could the report have been improved? _____

8. Other comments or suggestions: _____

Name _____ Title _____

Department _____

Company _____

Address _____

City _____ State _____ ZIP _____

Telephone _____ Date Completed _____

Thank you for your time and cooperation.

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